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TRIGGERS OF SICK LEAVE

Epidemiological Studies of Work-Related Factors

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*I'm not sure what I'm looking
for anymore,
I just know that I'm harder to
console.*

(M.L. Gore)

ABSTRACT

Background: In Sweden, the prerequisite for compensation during sick leave is a reduction of work ability due to disease or injury. Perhaps as a result of this, sick leave varies between individuals with the same diagnosis and over time in the population in a way that does not coincide with the variations in population health. This implies that to better understand the social phenomenon that is sick leave we need to look into other factors which may influence the association between disease, illness, sickness and sick leave.

Aim: The main aim of this thesis was to identify and estimate the effect of factors at work which influence ill individuals to take sick leave.

Methods: All four studies were based on data from the TUFS-project (an acronym in Swedish for “Triggers of sick leave”) which took place at six Swedish workplaces in health care, manufacturing industry, and white-collar office work between 2005 and 2007. A total of 1 430 employees (participation proportion 47%) answered a questionnaire at baseline and were subsequently followed with regard to sick leave for 3-12 months and interviewed during or shortly after taking sick leave. Study I used a cohort design assessing exposure at baseline with a longitudinal follow-up of sick leave, and Studies II-IV used a case-crossover design which included only individuals on sick leave, with each case serving as its’ own control. Exposure was measured in a telephone interview conducted during or shortly after sick leave.

Results: In Study I an increased risk of future sick leave was found for individuals with a low level of adjustment latitude, whether measured as the general level of adjustment latitude or as having few different types of adjustment possibilities. This is in line with previous studies of adjustment latitude. However in Study II, the results indicated that many individuals had a stable pattern of exposure to lack of adjustment latitude. Among the 35% with variations in exposure during the two weeks prior to sick leave a decreased risk of sick leave was found on days when the participants were exposed to lack of adjustment latitude. In Study III an increased risk of sick leave was found when individuals had been exposed to problems in the relationship with colleagues or superiors the previous two workdays. Furthermore individuals were more likely to take sick leave when they expected a very stressful work situation during the following workday. In Study IV an increased risk of sick leave was found when the participants expected a lower workload than usual.

Conclusion: A possible interpretation of the results from Studies I and II is that adjustment latitude both may capture long-lasting effects of a flexible work environment, and temporary possibilities to adjust work to being absent. The increased risks of sick leave found when having been exposed to problems in workplace relationships and when expecting a stressful work situation or a lower workload than usual (Studies III and IV) may function by lowering the threshold of reduced work ability at which an employee feel the need to take sick leave.

SAMMANFATTNING

Bakgrund: Nedsatt arbetsförmåga på grund av sjukdom eller skada, är förutsättningen för ekonomisk ersättning vid sjukfrånvaro i Sverige. Möjligen som en följd av detta varierar sjukfrånvaro, dels över tid i populationen på ett sätt som inte direkt speglar variationer i hälsa, och dels mellan individer med samma diagnos. För att öka förståelsen för det sociala fenomen som sjukfrånvaro är, måste vi därför studera faktorer som påverkar relationen mellan sjuklighetens olika uttryck och sjukfrånvaro.

Syfte: Det övergripande syftet med avhandlingen var att identifiera och uppskatta effekten av faktorer på arbetet som påverkar om sjuka individer beslutar sig för att vara sjukfrånvarande.

Metod: Alla fyra delstudier är baserade på data från TUFSS-projektet ("Triggers och Utlösande Faktorer för Sjukfrånvaro") som genomfördes vid sex svenska arbetsplatser inom hälso- och sjukvård, varuproduktion, kontorsarbete mellan 2005 och 2007. Totalt 1 430 anställda (47% deltagande) besvarade en baslinjeenkät och följdes sedan upp mellan 3 och 12 månader med avseende på sjukfrånvaro. De som var sjukfrånvarande intervjuades per telefon under eller i nära anslutning till sjukfrånvaron. I delstudie I användes en kohortdesign, med exponeringsmätning vid baslinjen och longitudinell uppföljning av sjukfrånvaro. I delstudie II-IV användes en case-crossover design där bara individer som var sjukfrånvarande under uppföljningen ingick, och dessa agerade som sina egna kontroller. Exponering mättes då i telefonintervjun vid sjukfrånvarotillfället.

Resultat: I delstudie I rapporterades en ökad risk för sjukfrånvaro bland individer med låga nivåer av anpassningsmöjligheter i arbetet, oavsett om detta mättes som den generella nivån eller antalet olika typer av anpassningsmöjligheter. Detta är i linje med tidigare studier. Däremot indikerade delstudie II att många individer var stabilt exponerade för brist på anpassningsmöjligheter. Bland de 35% som hade variationer i exponering under de två veckorna innan sjukfrånvaron, fanns en minskad risk för sjukfrånvaro under dagar då deltagarna var exponerade för brist på anpassningsmöjligheter. I delstudie III återfanns en ökad risk för sjukfrånvaro när individerna hade upplevt problem i relationen med kollegor eller chefen/arbetsledaren de senaste två arbetsdagarna. Dessutom hade deltagarna en högre tendens att sjukskriva sig dagar då de förväntade sig en mycket pressad arbetssituation. I delstudie IV rapporterades en ökad risk för sjukfrånvaro på dagar då deltagarna förväntade sig en lägre arbetsbelastning än vanligt.

Slutsatser: En möjlig tolkning av resultaten från delstudie I och II är att anpassningsmöjligheter både fångar långvariga effekter av en flexibel arbetsmiljö och tillfälliga möjligheter att anpassa arbetet till frånvaro. Den ökade risken för sjukfrånvaro när deltagarna upplevt problem i arbetsrelationer eller när de förväntade sig en mycket pressad eller en lägre arbetsbelastning än vanligt (delstudie III och IV) kan fungera genom att sänka tröskeln för den grad av arbetsförmågereducering, vid vilken individen känner ett behov av att vara sjukfrånvarande.

LIST OF PUBLICATIONS

- I. Hultin H, Hallqvist J, Alexanderson K, Johansson G, Lindholm C, Lundberg I, Möller J. Low level of adjustment latitude – a risk factor for sickness absence. *European Journal of Public Health* 2010 Dec;20(6):682-688.
- II. Hultin H, Hallqvist J, Alexanderson K, Johansson G, Lindholm C, Lundberg I, Möller J. Lack of adjustment latitude at work as a trigger of taking sick leave – a Swedish case-crossover study. (In manuscript)
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LIST OF ABBREVIATIONS AND CONCEPTS USED

CI	Confidence Interval
ERI	Effort-Reward Imbalance
IFM	Illness Flexibility Model
OR	Odds Ratio
RCT	Rational Choice Theory
RTW	Return to work
SCT	Social Cognitive Theory
TPB	Theory of Planned Behaviour
Sick leave/sickness absence	Both terms will be used interchangeably meaning being absent from work due to illness or disease.
Illness	The term will be used for all types of ill health due to disease, injury or other causes which may lead to sick leave.

1 INTRODUCTION

The right to be absent from work when ill, and to be compensated for income loss during this absence, is an important feature of the industrialized welfare society.

Sick leave can be regarded as a measure of morbidity and previous research also indicate that it is a predictor of mortality (1-7). Sick leave has social and economic consequences for individuals, families, workplaces and societies (8-11). The Swedish Social Insurance Agency estimated that their total cost for the sickness benefit and disability pension for 2010 was approximately 78 billion Swedish kronor (approximately 9.2 billion Euros) (12). To this cost, one could add the cost of the two-week sick-pay period which is financed by the employer, costs for production loss etc.

However, in Sweden, the prerequisite for compensation during sick leave is the presence of a disease or injury that reduces the work ability (13-15). Perhaps as a result of this, sick leave varies over time in the population in a way that does not coincide with the variations in population health. In general, the health of the Swedish working population has improved in the last decades, yet the number of sickness-benefit days has varied markedly during the same period (11, 16, 17). Moreover, sick leave also varies between individuals with the same diagnosis (18). This implies that to better understand the social phenomenon that is sick leave we need to look into other factors which may influence the association between illness, sickness, disease and sick leave. This thesis is specifically devoted to the study of factors at work which might influence an ill individual to take sick leave.

2 BACKGROUND

Sick-leave research is a large and diverse field and scientific studies of sick leave can differ severely from one another, both in terms of focus, scientific discipline, perspective and structural level of factors studied. Table 1 describes a general categorization used in a systematic review of the area conducted by the Swedish Council on Technology Assessment in Health Care (18). This thesis is focused on studying individual factors which influence the tendency for an individual to take sick leave, i.e. become a sickness absentee.

Table 1. Categorization of studies of sick leave (18); The categories most relevant to the subject of this thesis are indicated in bold type.

Focus of the study	Scientific discipline	Perspective taken in the study	Structural level of the factors included in the empirical analyses
Risk factors of sick leave Factors that hinder or promote RTW Consequences of being sickness absent Sickness certification practice	Medicine Sociology Psychology Economics Law Public health History Philosophy Management Anthropology	Society Local society Insurance Health services (physicians and managers) Employer Sickness absentees	Individual Family Workplace Organization Community National International

2.1 SICK LEAVE IN SWEDEN DURING THE 1990'S AND 2000'S

In Sweden, the number of sickness-benefit days per person-year declined until 1997, after which they increased steeply (11, 16, 17). After 2002 the number of sickness-benefit days has again declined and were during 2010 on a lower level than during 1997. It was during this period of decline that the data which this thesis is based on was collected (see Figure 1).

The increase during the latter half of the 1990's evoked considerable political activity and public debate (11). There are many theories which try to explain the fluctuations in the number of sickness-benefit days over time, but these will not be examined here (11, 16, 18).

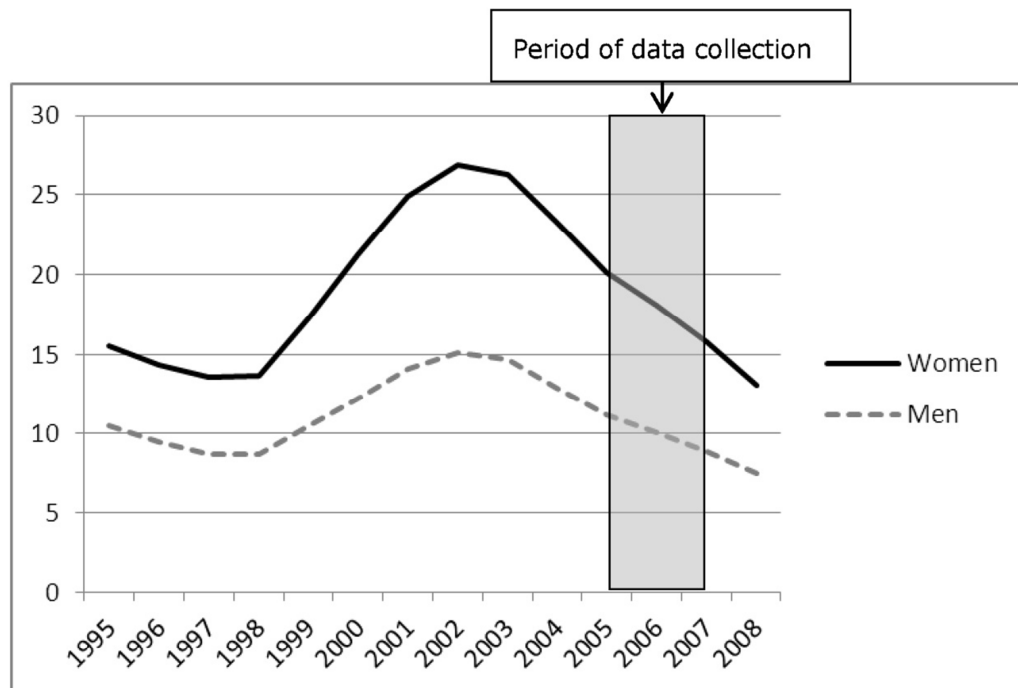


Figure 1: Number of sickness-benefit days per person-year by sex. The period during which data collection took place is shaded. Data from the Swedish Social Insurance Agency.

It is always difficult to compare sick-leave levels across countries, due to differences in employment rates and social insurance systems. With that noted, Sweden, together with Norway and the Netherlands, forms a group of countries with sick-leave levels above the other European countries (11, 16). The Netherlands has seen a similar decline in sick-leave levels as Sweden from 2004, but in Norway the sick-leave level has remained fairly unchanged between 1999 and 2008 (16).

2.2 SICK-LEAVE LEGISLATION IN SWEDEN

The Swedish Sickness Insurance is a product of the industrialisation and urbanisation of the 1800's. The early system of self-help organisations was inspired by the guild systems of the city to provide subsistence for the members during illness (19). However, it was not until the early 1900's that the idea of public sickness insurance societies with mandatory membership became a prominent political issue (19). From 1955 Sweden has a mandatory sickness insurance, and the compensation is income based (19). Today, the sickness insurance covers everyone in Sweden who has an annual income from work above a stated minimum (approximately 1 200 Euros in 2011) (17).

At the time of the collection of the data which this thesis is based on, the Swedish sick-leave legislation was mainly covered in two acts, the Sick Pay Act (14) and the National Insurance Act (13):

An employed individual who has reduced work ability due to disease or injury can receive compensation in the event of loss of income. An individual can be on sick leave 25%, 50%, 75% or 100% of ordinary working hours, depending on the extent to which a person's work ability is reduced. During the first 14 days of a sick-leave spell, an employee receives the compensation, termed sick pay, from the employer. Sick pay is not paid for the first sick-leave day, which is a qualifying "waiting" day. The sick pay for complete reduction of work ability covers 80% of the lost income, up to a stated maximum (equivalent of an annual income of approximately 37 000 Euros) (14, 17).

After the two-week period of sick pay, an individual with reduced work ability due to disease or injury can receive sickness benefit, which is disbursed by the Swedish Social Insurance Agency and was until December 2010 covered in the National Insurance Act (13). The sickness benefit for complete reduction of work ability covered up to 80% of an employed individual's wage (with the same maximum as for sick pay).

Since the period of the data collection, several changes have been made to the Swedish sick-leave legislation. In summary, the period during which sickness benefit is disbursed now has a time-limit, with statutory check-up intervals for assessments of work ability, at 90, 180 and 364 days of sick leave. After 180 days, an employed individual only qualifies for sickness benefit if he or she is unable to perform any kind of work in the labour market. If granted prolonged sickness benefit after 365 days the compensation level is 75% of the wage. The regulations concerning the sickness benefit is now covered in the Social Security Code (15, 17).

2.3 ILLNESS, SICKNESS, DISEASE AND SICK LEAVE

As mentioned above, the Swedish sick-leave legislation is focused on determining a reduced work ability due to disease or injury. Generally, the scientific literature differentiates between *illness* which is the ill health an individual perceives, often based of self-reported mental or physical symptoms, *disease* being the part of ill health which there are medical diagnoses for at a certain point in time, and *sickness*, which is the social role an individual with illness or disease may be allowed to take in a society (18, 20). Throughout this thesis, the term illness will be used for all types of ill health caused by disease, injury or other causes which may lead to sick leave.

The three different aspects of ill health do not coincide. Furthermore, none of the aspects are equivalent to the concept of sick leave. Sick leave entails a social role and may as such be considered as part of sickness, but many individuals which have a sick role due to illness or disease do not take sick leave (18).

2.4 FUNCTIONAL CAPACITY, WORK ABILITY AND SICK LEAVE

During the first seven days of sick leave, it is the ill individual who makes the assessment of whether his or her work ability is reduced due to a disease or injury. After that a medical certificate is needed. In the process of sickness certification a

physician first determine whether a disease or injury exists and then whether the functional capacity of the individual is reduced due to this disease. In a next step, the physician determines whether the patient's work ability is reduced due to the disease (18, 21). The medical certificate is used as base when an officer at the Swedish Social Insurance Agency makes the final decision of whether sickness benefit should be disbursed.

The Swedish Sick Pay Act (14) states that work ability should be assessed with specific focus on whether the disease or injury hinders the individual from performing his or her normal work tasks or other tasks which the employer can offer the individual employee. This implies that when work tasks cannot be performed due to the disease or injury, work ability is reduced. Nevertheless, there are different views on what the concept of work ability should entail, and what instruments should be used when assessing it (22, 23). There are also different names for the concept: in Great Britain and in the English translations of the Swedish Social Insurance Agency's information, the word 'work capacity' is used. The term work ability will be used throughout this thesis.

Several studies indicate that assessing functional capacity, work ability and the patient's need for sick leave is commonly experienced as problematic by physicians (21, 24-26).

2.5 WORK-RELATED RISK FACTORS OF SICK LEAVE

Considering the fact that a reduction of work ability due to disease is the legal prerequisite for eligibility to sick pay and sickness benefit, and that sick leave in most instances implies absence from work, it is not surprising that a lot of focus has been put on the workplace, when trying to understand why individuals take sick leave.

Several studies have indicated that a physically demanding work increases the risk of sick leave (27-38). Specifically, employees who lift, pull or push heavy loads in their work or whose work tasks imply awkward body positions appear to have a higher risk of both short-term and long-term sick leave (27, 30, 31, 34, 35, 37). The results found for the effect of repetitive work tasks are less unanimous (30, 31, 34, 37).

Different theoretical models have made attempts to define the psychosocial factors in the work environment which affect employees' sick leave. The demand-control or job-strain model is perhaps the most commonly cited (39, 40). Initially the model focused on the two key elements: control/decision latitude (measuring both the employee control over decisions and the degree of variety and learning involved in the work tasks) and psychological demands (which measure pace, amount of work, and presence of contradictory demands) (40). A later, revised version of the model also contain social support (measuring workgroup cohesiveness and ambience as well as the relationship with colleagues and superiors) (39). Karasek and Theorell (39) use combinations of the concepts of their model to define the level of strain in different occupations, with the combination of high psychological demands and low control/decision latitude resulting in high job strain, which in turn is expected to have adverse health effects. The results from studies of the demand-control model and sick

leave are somewhat complex. Individuals with low job control/decision latitude appear to have a higher risk of sick leave (27, 41-51). The effect of high psychological demands is not as clear cut, with some studies reporting an increased risk (42) some reporting an increased risk only for sub-groups (43, 45, 47) some studies reporting a null effect (41, 46, 51) and some reporting a decreased risk of sick leave with high demands (27, 48, 49). The effect of job strain and social support are also somewhat inconclusive (27, 42, 46, 47, 51-57).

The Model of Effort-Reward Imbalance (ERI), put forward by Siegrist (58) implies a shift of focus from control to rewards. In Siegrist's view, the beneficial effects of working, and of having a work role, are dependent upon the prerequisite that the efforts made at work are rewarded by society through money, esteem or status control (the latter measured as occupational stability and promotion prospects) (58). The effort aspect is measured both as extrinsic demands and as intrinsic coping (58). ERI predicts that imbalance between efforts and rewards will affect health adversely. To handle this imbalance individuals will try to change jobs or reduce their efforts (58). In their initial study, Peter and Siegrist (59) hypothesized and subsequently reported that low rewards, but not high efforts, were associated with sick leave. This was interpreted as an indication of passive coping (59). However, later studies have indicated an association between effort-reward imbalance (normally assuming high efforts and low rewards) and different measures of sick leave, although these are mainly based on cross-sectional data and all use different measures of effort-reward imbalance (60-64). Only one study explicitly studied over-commitment and it did not find an association with sick leave (63).

In the last decade, aspects of organisational justice (or organisational fairness) and their association with sick leave has gained increasing interest. Quite like ERI, the concepts of organisational justice imply that when employees experience an imbalance between input and outcome they will be affected negatively (65, 66). The definition of organisational justice is not entirely clear, three different forms are commonly mentioned; procedural justice (the extent to which decision-making procedures include input from affected parties, are consistently applied, suppress bias, and are accurate, correctable and ethical), relational or interactional justice (measuring polite, considerate and fair treatment of individuals) and distributive justice (measuring the perceived fairness of employees' outcomes at work) (66, 67). In the ten found studies of organisational justice and sick leave eight studied procedural justice, seven relational justice and three studied distributive justice (62, 65-73). The picture is relatively clear; all three aspects, procedural, relational and distributive justice appears to be associated with sick leave (62, 65-73). Only one study reported no effect of procedural justice and two studies reported that there was only an indirect effect of procedural and distributive justice through emotional exhaustion and psychosomatic health complaints (65, 66, 70). One study found that the association between interactional justice absence frequency was mediated by individuals' affective commitment to the organisation (71). One study also reported a reverse relationship, previous sick leave decreased future reports of distributive justice, which in turn further increased future sick leave (previous sick leave adjusted for) (70).

The existence and nature of a relationship between work satisfaction and absence was a research question of interest in many early studies of causes of absence from work (74-76). Several papers from the 1970's and 1980's build a strong case against what is described as "the previous assumption" that a low satisfaction increases the absence tendency (75, 77, 78). The critique of that assumption is mainly methodologically based, pointing out obvious risks of reverse causation, non-existing or sparse confounding control and limited data materials (75, 78). However, more recent research, although not always free from bias and limitations, still suggest that low levels of general satisfaction with work is associated with higher levels of sick leave (7, 34, 35, 38, 79-83).

An abundance of other psychosocial indicators have been linked to sick leave. However, it is hard to generalize the effect of such indicators on sick leave since most of them are either based on a single or very few studies, with a specific sample of employees, or only report significant associations among sub-groups of employees (42, 50, 51, 60, 84-89).

2.5.1 Risk factors of illness vs. risk factors of sick leave

The question remains: *How* do different work-related factors affect our tendency to take sick leave? Psychosocial factors at work have commonly been linked to illness through the so called stress hypothesis, which states that long-term exposure to psychological and environmental stressors, can lead to an overexposure to stress hormones with adverse effects on the cardiovascular, metabolic and immune systems (18, 39, 58, 90-92). Used in the context of sick-leave research, the stress hypothesis assumes that psychosocial exposures make us ill, which in turn increases the risk of sick leave (see Figure 2a). The demand-control model is based on such an assumption(39). In essence, studies based on the stress hypothesis study risk factors of illness, and sick leave can be regarded as a consequence of illness or as a proxy outcome measure of illness (18).

Another commonly proposed mechanism is that of absence as a function of an employee's satisfaction or motivation (see Figure 2b) (18, 76-78, 93, 94). Part from the already mentioned studies of satisfaction, some of the studies of organisational justice are based on such assumptions, the latter being viewed as risk factors influencing satisfaction or motivation (65). The effort-reward model opens for the possibility of effort and reward working through both mechanisms. Peter and Siegrist (59) hypothesise that low rewards in the absence of high efforts will lead to passive coping through sick leave, yet in combination with high efforts, low rewards is assumed to increase cardiovascular risk (thereby assumingly increasing the risk of sick leave). In studies assuming a mechanism through satisfaction or motivation, sickness absence is not normally distinguished for other forms of absence, and the illness-related causes of sick leave are not heavily emphasized (18).

Several other mechanisms for the effect of work-related risk factors on sick leave have been discussed, one being that certain factors may affect the tendency to which ill people take sick leave (18, 62, 95-98). Such a mechanism entails a relationship between disease and work demands as proposed in the Swedish legislation. It also emphasizes

the fact that sick leave can be regarded as decision-making process. The individual is assumed to consider his or her illness, in relation to work demands and other factors, when making the final decision of whether to take sick leave or go to work despite illness (see Figure 2c), although some situations, for instance unconsciousness, may prohibit such an individual decision. Regardless of how work-related factors affect our health, the way we act when ill, and the factors affecting this, is also of importance.

The three mechanisms in Figure 2 are not mutually exclusive. In 2a risk factors are assumed to cause illness or disease. In 2c risk factors are assumed to influence the decision to take sick leave when ill. In mechanism 2b the effect of illness or disease on sick leave is not of primary interest. Neither 2b nor 2c excludes the possibility that illness/disease is caused through a mechanism such as 2a. Furthermore, low motivation or satisfaction may be a risk factor of interest in 2a and, given the prerequisite that illness or disease is prevalent, also in 2c.

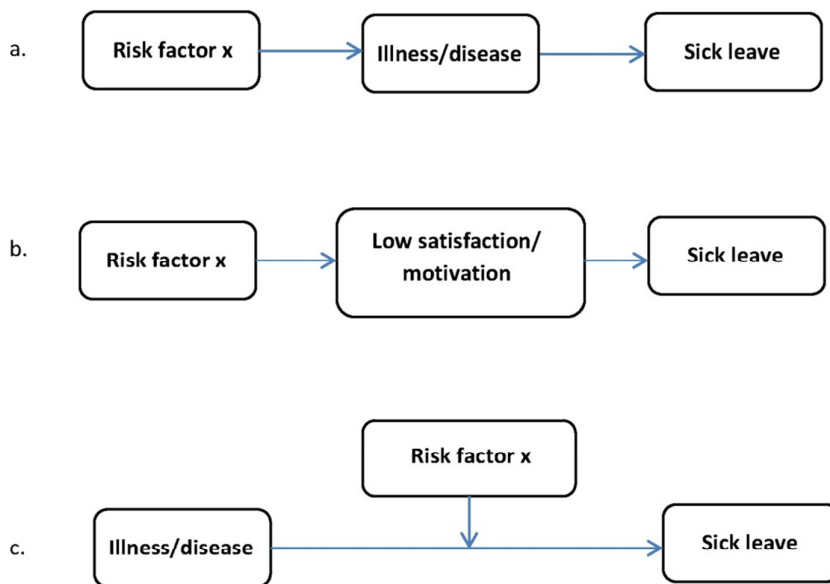


Figure 2a-c. Mechanisms of work-related risk factors of sick leave.

2.6 GENERAL THEORIES OF ACTION AND DECISION-MAKING

If one wants to investigate the possibility that sick leave is not an absolute consequence of illness or dissatisfaction, one needs to look into some of the fundamental aspects of human action and decision-making. If we want to find out more about what factors influence individuals when making the decision to take sick leave, we need to know more about what the basic forces are that make individuals behave the way they do. There are different theories on this.

According to the Theory of Planned Behaviour (TPB), as proposed by Ajzen (99, 100), our actions are governed by our intentions (that is, what we aim to do), our perceived behavioural control (what we feel capable doing) and subjective/personal norms (how we ourselves or others value the action). Furthermore, Ajzen (100) emphasize that situational factors, for instance situational constraints, may modify the effect of stable attitudes and personality traits. The Social Cognitive Theory (SCT), as put forward by Bandura (101, 102), also identifies perceived capabilities, or self-efficacy, as an important factor for explaining actions. However, a lot of focus is put on different types of incentives, vicarious learning (we learn and get motivated by seeing other individuals act, and by seeing them succeed or fail and judge the consequences it has for them) and expected consequences. Bandura (101) differentiates between activity incentives (you perform an action to get the chance to perform another higher valued action), self-evaluative incentives (individuals are motivated by seeing the progress in what they are doing) and social incentives (people will do things for approval and refrain from actions that arouse the wrath of others).

Unlike TPB and SCT, Rational Choice Theories (RCT) (or Rational Action Theories) are not mainly interested in predicting individual behaviour, but rather focusing on the social outcomes of assumingly rational individual behaviour (103, 104). The model of the rational actor is not assumed to be able to capture all features of actions of the flesh-and-blood individuals involved, but only the relevant main tendencies in their actions (103). Hechter (104) differentiates between thin RCT models of individual action which do not include assumptions about the actors' motivations, and thick models in which motivations and values are stated. Since values are hard to measure, rational-choice theorists using thick models often assume some general rules for individuals' values, like wealth or utility maximization, however models assuming values of local status or distributive justice also exist (104). When explaining the decision-making mechanisms, models based on utility maximization normally assumes that actors are forward-looking, and assign objective or subjective probabilities to various future states and make their decisions according to these probabilities (103, 104). However, other rational-choice theorists argue that individuals are not only forward-looking but sideways-looking cultural imitators, whose decisions mimic that of successful neighbours, in a way that is similar to the vicarious learning process proposed by Bandura (101), and that whether actors are forward-, backward- or sideways-looking depends on the nature of the available information about the future (104).

According to Berglinds (105) version of Action Theory ("handlingsteori" in Swedish) a lot of actions which appear to be unintentional are a result of contradictory intentions: *"We act in accordance with today's intentions if yet not with yesterday's"* (p 39).

Much of our actions have a social significance and are affected by norms and conventions. Perhaps as a result, we may feel that some actions are involuntary, when they are just imperative in the sense that the social norms dictate them. Berglind defines an individual's acting space in terms of whether the actor "wants", "can", "wants *and* can" or "neither wants *nor* can" perform them, in a way that bear many similarities with TPBs "intentions" and "perceived behavioral control". However, Berglind also opens for the existence of possible actions, which the actor does not know if he or she wants or can perform (105). Although Berglind in essence follow the same general rules of consistency as rational choice theories, he also focuses on simultaneous contradictory goals and forced changes, which both can restrict rational action (105).

In Adams' Equity Theory (106), the assumption of rational calculating behavior is also apparent, however the basic driving force behind human actions are not value maximization per se, but a state of equity in exchanges. This means that the ratio of an individual's output to input should be experienced as equal to the ratio of "the other's" output to input. If this is not fulfilled, it may lead to dissatisfaction, anger or guilt, but inequity may also predict individual behavior in the sense that the individual will try to restore equity by either altering his or her input or output (106).

2.7 SPECIFIC THEORIES OF ABSENCE AND SICK LEAVE

Several of the existing theories and theoretical models concerning absence from work have a focus on absence as an action. As described absence as a function of forces *pushing* an individual from work into absence (for example a negative work situation) and forces *pulling* an individual to work (for example a high degree of commitment to the company) (94). The Process Model, presented by Steers and Rhodes (107), build further on the previously mentioned view of absence as a function of satisfaction (Figure 2b), by stating satisfaction is the fundamental basis of attendance motivation. However, the Process Model also include concepts of attendance ability and internal and external pressures to attend which can be seen as specifications of the broader theoretical concepts of Berglinds Action Theory or the Theory of Planned Behaviour. Burton and colleagues (108) empirically tested the Process Model on different types of absence. Low attendance motivation, but not low attendance ability, was significantly negatively associated with absence due to illness after adjustments for age, tenure, gender and education, but not health status (108). Burton did not study internal and external pressures to attend.

Although The Process Model does not emphasize absenteeism as a rational decision-making process, the general satisfaction mechanism (Figure 2b) can easily be viewed in terms of Equity Theory (76). In DeBoers (65) study of organisational fairness, absence is viewed as reaction to unfair treatment, and considered as way for the employee to lower the inputs into the exchange relationship. As have been mentioned previously, the Model of Effort-Reward Imbalance both implies that sick leave is used as a way to lower input in an inequitable exchange relationship, and that effort-reward imbalance have an effect on sick leave via stress/health (63, 109).

The influential work of Hill and Trist (110) can be considered as one commonly used departure point when modelling social norms which influence individuals' sick-leave actions. In their view, the worker-workplace relationship implies a stressful experience for any worker (110). Over time the worker will learn to handle this in legitimate ways, through sick leave, partly because the investments made in the work are greater, and partly because of internalized norms. The internalized social norms, which Hill and Trist refer to as "the absence culture" are learned, "vicariously" if using Banduras (101) terms, through watching other workers and watching how different types of absence behaviour is treated in the organization. According to Hill and Trist (110) the reaction is not to be considered as malingering, but rather a case of "somatic conversion" through which the conflicts and stress is transformed into minor illnesses. In this way it has clear connections to the stress hypothesis (Figure 2a).

Nicholson (93) criticizes other absence theories for viewing absence as a reaction rather than an action. According to Nicholson (93), attendance is the normal behaviour in most occupations, even those where absence levels are considered high. A theory of absence should therefore try to identify factors that act as constraints or barriers to attendance. Such factors can be placed on an A to B continuum, where the A pole represents events which will involuntarily lead to absence and the B pole represents those that are entirely controllable by the individual (93). Where on the continuum a certain event falls, will differ between individuals and for the same individual at different times. Nicholson also discusses the possible interaction effect of simultaneous exposures, stating that the combination of two events in the B end of the continuum may together constitute a situation that ends up in the A end for an individual. A key feature of the model is that the motivational state of the person determines his or her susceptibility to the potential proximal causes of absence, i.e. the threshold on the A-B continuum at which an exposure will result in absence. The individual threshold is mainly dictated by an individual's attachment to the workplace, which in Nicholson's words is a measure including such different aspects as personality traits, an individual's work-related expectations and needs, the level of skill discretion in the occupation, the influence of formal control and reward systems at the workplace, and the existence of workgroup norms and institutional trust (93).

In a later work, Nicholson and Johns (111) oppose the view that absence is an individual behaviour and suggest that individual absence is mainly influenced by a collectively shared absence culture. This is in clear accordance with Hill and Trist's (110) description of how workers internalize the norms of the organization (111). Nicholson and Johns describe this internalization process as the creation of a psychological contract between the employee and the workplace which dictates how the absence culture is acted out (111). The absence culture is seen as product of *the psychological contract* which includes trust and beliefs about absence and employment and *the cultural salience*, which determines how forceful the absence culture is. Cultural salience reflects the unique combination of technology, interpersonal relationships and absence control under which the employees work. The absence culture includes norms regarding the accepted level of absence that is tolerated, but may also indirectly modify the effect of satisfaction or personal characteristics on absence. The empirical results testing these theoretical concepts are scarce, but suggest that both prior individual absence, workgroup-level absence and culture-level absence predicts

perceived absence norms, which, in turn, predict future individual absence (71, 112). Bamberger and colleagues (113) emphasized the effect of norms of work-based referent others as opposed to that of formal work-units, in predicting what was defined as “excessive absenteeism”. It is unclear through which mechanism Nicholson and Johns (111) assume that the absence culture has an effect on sick leave. A possible interpretation is that the psychological contract helps to define the threshold of illness at which an individual can allow him- or herself to take sick leave. This would be in line with Nicholson’s (93) previous work and with the mechanism described in Figure 2c.

In the work by Kristensen (98, 114), sick leave is regarded as the result of an individual choice, where the ill employee tries to handle several different, often contradictory, demands. Given the illness, several different factors may influence the individuals when deciding to take sick leave or not. Sick leave then becomes a coping mechanism, existing side by side with other coping possibilities at work. Where previous models have tended to focus on either pushing or pulling factors, Kristensen define both absence and attendance factors, which in turn can be based on both positive and negative underlying aspects. In the words of Kristensen (114), “*absence from one place means presence in another (often at home)*”. Thus, a positive absence factor may be the care needs of other family members, while negative ones may be illness or low work satisfaction. A positive attendance factor may be stimulating work tasks and a negative one may be negative sanctions from colleagues or superiors. The description of the individual making a conscious choice suggests rationality, but the goal in this case is not wealth maximization, but rather a wish to keep or restore one’s health and work ability. Considering his criticism of theorists viewing sick leave as a function of health (the stress hypothesis for instance), Kristensen’s own empirical results are somewhat ambiguous, in that they do not essentially contradict such a mechanism (98).

Absence from work can be due to many different reasons; vacation, parental leave, strike, and so on. The absence can be legitimate and non-legitimate, health-related and non-health related (18). It is important to note that neither The Process Model nor the concept of absence culture differentiates between sick leave and other forms of absence (76, 111). Although Kristensen’s (98, 114) work on absence and attendance factors specifically considers sick leave, he does not emphasize the effect of health on sick-leave behaviour. Both Nicholson (93) and Kristensen (114) present illness as one of several other attendance barriers or absence factors of assumingly equal importance. Although Burton (108) differentiates between sickness absences and other absences in his test of the Process Model there is little emphasis on the general position of health or illness in the model, nor is there any discussion on how health can be related to attendance motivation.

2.7.1 The Illness Flexibility Model

The main theoretical departure point of this thesis, the Illness Flexibility Model (IFM) presented by Johansson and Lundberg (95, 96) has two major differences with the theoretical perspectives described above. Firstly, it considers illness as a prerequisite cause of sick leave, implying a mechanism such as the one described in Figure 2c. Secondly, it is also the only one of the theoretical perspectives that specifies that ill health affects sick leave through reduced work ability. The model assumes that

individuals' life situations involve different possibilities to embrace ill health by giving different opportunities of remaining at work or being absent.

The pushing and pulling forces in the IFM have similarities with “internal and external pressures to attend” described in the Process Model, but even more so with Kristensen's absence and attendance factors in that they are more focused on concrete life situations than on internalized norms.

The concepts of the IFM are described schematically in Figure 3 (95):

Attendance requirements are factors that imply negative consequences of being absent, which may make a person more inclined to attend work despite being ill, for instance that absence may imply an increased work load for colleagues, or that activities at work will have to be cancelled. Loss of income can also be considered as an attendance requirement.

Absence requirements instead describe negative consequences of attending work when ill. The risk of contaminating colleagues, customers or patients is one such potential factor.

Together attendance and absence requirements make out the part of the motivational structure that signifies what individuals feel they *ought to or should* do.

Attendance incentives are conditions that make people more inclined to go to work despite illness, for instance stimulating work tasks and supportive work climate.

Absence incentives describe aspects that make individuals less inclined to go to work despite being ill. Johansson (95) mentions caring for children, other relatives or pets as possible such factors.

Attendance and absence incentives are assumed to make out the part of motivation that signifies what individuals *want to* do. Johansson (95) does not explicitly state where in the model aspects of the psychosocial work environment, such as conflicts, bullying or a monotonous work may be placed.

The IFM also includes the concept *adjustment latitude* which is meant to capture the possibilities that an individual have to temporarily adjust work tasks or the workday to reduced health. Examples of such adjustment possibilities include changing work tasks, shortening the workday, getting help from colleagues and working at a slower pace.

The concept of adjustment latitude differs from the control aspect Karasek and Theorell's Demand-Control Model (39) and what Kristensen (98) defines as coping possibilities at work, in that it specifically concerns the possibilities to handle working with ill health, not adjustments for other reasons (95).

In the Illness Flexibility Model, one can easily see the imprint of the TPBs concepts of perceived behavioural control (defined by health, skills/knowledge and adjustment latitude) and intentions (defining incentives) and subjective/personal norms (defining requirements) (99).

In one cross-sectional and one longitudinal study Johansson and Lundberg showed results that indicated that adjustment latitude was associated with higher level of sick leave, although in the longitudinal study it was the intermediate and not the low level of adjustment latitude that increased the risk of sick leave (95, 96). An association between attendance requirements and sick leave was also reported in the cross-sectional study, but the longitudinal study found no support for a relationship between financial attendance incentives (reporting difficulty in raising cash) or home-related absence incentives (reporting demanding home tasks) and subsequent sick leave (95).

Furthermore, Johansson and colleagues (115) found that high levels of adjustment latitude (measured as having many different adjustment opportunities) increased the likelihood of return to work among after long-term sick leave.

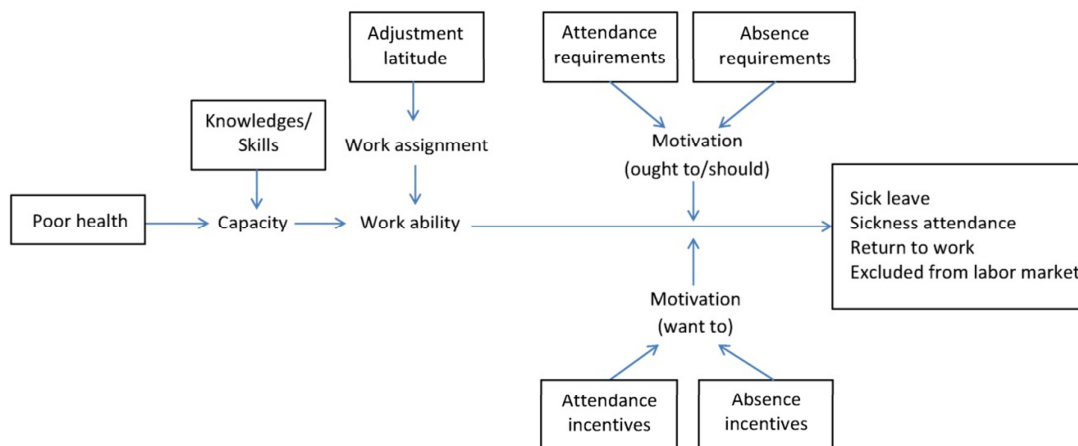


Figure 3: The Illness Flexibility Model (95).

2.8 WHAT IS A TRIGGER?

Maclure and Mittleman (116) define a trigger as a more proximal cause. A trigger's contribution to the causal process can be understood, according to the sufficient-component-cause model (117), as one of the last component causes which when added will make the sufficient causal pie complete. In practice, a trigger's induction time, that is, the time between exposure to the cause and the outcome event, is assumed to be short, hours or days rather years.

Johansson has stated that the induction time for the concepts of the Illness Flexibility Model can be assumed to be short (95). The theoretical definition of adjustment latitude, which differentiates it from other theoretical concepts such as decision latitude, is that it is assumed to imply possibilities to adjust work when ill, thereby having its' main effect on alternative actions when ill. The position of the different requirements

and incentives in the model also clearly implies that the time between cause and at least one of the effects of the concepts is expected to be short.

2.9 THE CASE-CROSSOVER DESIGN

A case-crossover study is designed to answer the question: “*Was this event triggered by something that happened just before?*” The design was invented in the 1990’s and was first used to study triggers of myocardial infarction (116, 118), but has since then also been used to study non-medical triggers of decision-making processes, for instance health-related media messages as triggers of contacting a general practitioner (119, 120).

In a case-crossover study, only individuals with the outcome are included, and each case acts as its’ own control. Exposure frequency during a time period in close proximity to the outcome, the *case period*, is compared with exposure frequencies during one or more *control periods* for the same individual. If an exposure has a trigger effect, it should be more frequent in the case period, close to the outcome event than in the more distant control periods (116, 121). The length of the case period is determined on the basis of the hypothesized hazard period and the expected induction time. The hazard period is the period after an exposure begins, during which a population experiences an increased risk of the outcome. The length of the hazard period is determined by examining the exposure frequency and subsequent risk of outcome in a series of case periods (122).

The control information can either be gathered according to the matched pair interval approach, where exposure is measured during a matched control period of the same length as the case period, or according to the usual frequency approach, where the added exposure frequency during a longer period of time is used to calculate the expected odds of exposure in the case period (116).

3 AIMS OF THE THESIS

3.1 OVERALL AIM

The overall aim of this thesis is to identify and estimate the effect of factors at work which influence ill individuals to take sick leave.

3.2 SPECIFIC AIMS

- To investigate the association between low levels of adjustment latitude and future sick leave (Study I).
- To investigate whether ill individuals are more likely to take sick leave on days when they experience a lack of adjustment latitude at work, than on days with access to adjustment latitude (Study II).
- To investigate whether recent exposure to work-related psychosocial events can trigger the decision to report sick when ill (Study III).
- To investigate whether ill individuals are more likely to take sick leave on days with a lower workload than usual (Study IV).

4 MATERIAL AND METHODS

All four studies are based on data from the TUFs-project (an acronym in Swedish for “Triggers of sick leave”) which was conducted at six Swedish workplaces between April 2005 and February 2007. The TUFs-project was initiated in 2004. A project-steering group consisting of researchers from two departments at Karolinska Institutet, Stockholm County Council, Centre for Health Equity Studies (CHESS), and the National Institute of Working Life participated in the general design of the project and of questionnaires and interview forms used during data collection. The aim of the project was twofold, firstly to identify factors that could trigger sick leave, and secondly to test whether exposures operationalized from the concepts of the Illness Flexibility Model could function as trigger factors in a decision-making process preceding sick leave.

4.1 THE PILOT AND FOCUS-GROUP STUDIES

In March 2004 a pilot study was conducted at a municipal nursing home in Stockholm, both to test the logistics of the data collection and to test possible interview questions. Two staff coordinators, to whom all employees at the nursing home reported when taking sick leave, were instructed to ask all employees who reported taking sick leave during a one-month period to participate in a test interview with members of the TUFs-project administration. The general lessons learned from the pilot study was that it was important to make sure that the individuals assigned to report sick-leave spells really understood that all sick-leave spells should be reported (not only long-term spells for instance), and that the employees on sick leave preferred a telephone interview to a face-to-face interview at home. The pilot study also indicated that the respondents in general did not find it hard to remember situations and circumstances at work during the last two weeks.

To generate further hypotheses and to operationalize the theoretical concepts of the Illness Flexibility Model, a private research company, Visus Market Research AB, was hired to conduct a focus-group study. Two two-hour long focus-group interviews were conducted in June 2004. The aim of the study was to explore different “non-medical” reasons (i.e. not directly related to the illness in question) for sick leave. Members of the project-steering group and the focus-group study conductors together constructed an interview guide based on the concepts of the Illness Flexibility Model. The inclusion of participants was based on fulfilling the criteria of having had at least one sick-leave spell during the last two years, and on the wish of creating a group with different reasons for sick leave represented. Each focus group consisted of 8 individuals: group 1 included assistant nurses and blue-collar workers within private industry and group 2 consisted of nurses and white-collar employees within public administration. Nine of the 16 participants were women, there was an even age distribution over the ages 20–60, and different household types and marital statuses were represented. The interviews were conducted by staff of the research company with members of the TUFs-project administration observing behind one-way mirrors.

The aspects which were brought up and discussed during the focus-group study are presented in Table 2, divided under the concepts of the Illness Flexibility Model. The results of the study implied that the participants easily came up with situations which could contribute to the decision to take sick leave. Furthermore, the examples which were brought up spontaneously by the participants, or after probing by the study conductors, were easily grouped under the concepts of the Illness Flexibility Model.

Table 2. Aspects identified as affecting taking sick leave, in analyses of data from focus-group interviews, organized under the concepts of The Illness Flexibility Model (IFM)(95).

IFM concept	Definition	Focus-group issue
Absence requirements	Experienced negative consequences of being present at work which could affect the individual, work colleagues or third party.	Risk of contamination. Reduced work ability due to ill health/disease. Risk of health problems because of bad physical work environment. Being unwanted at work.
Private/home related absence incentives	Experienced positive aspects of absence from work.	Getting well from disease. Possibility of recuperation. Caring for significant other or pet. Monitor or straighten out family conflicts. Catch up on household tasks. Run errands. Socializing with the family. Other more fun leisure time activities. Go to funeral of significant other.
Work-related absence incentives	Experienced positive aspects of absence from work.	Insufficient appreciation from superior or colleagues. Being afraid of or feeling discomfort concerning certain work tasks. Pressured work situation. High demands from superiors. Conflict/ being discontent with superiors. Conflict with colleagues. The work schedule allows staying home without affecting work activities. Having too few work tasks.
Attendance requirements	Experienced negative consequences of being absent from work which can affect the individual, colleagues or third party.	Loss of income. Administratively bothersome to stay home. More work upon return to work. Work activities will have to be cancelled. Responsibility for clients and customers. Worsened work conditions. Becoming unpopular/mistrust from colleagues.
Attendance incentives	Experienced positive aspects of attending work.	Having a fun and stimulating job. Having fun at work/sense of belonging. Get appreciation. Getting to focus on work instead of on personal problems. Acting on own moral rules/fulfilling positive self-image. Having a reason to get away from home. Stronger feeling of time off when off-duty.
Adjustment latitude	Possibilities to reduce or in other ways change the work effort or demands to reduced health.	Lower the physical load. Change to more social contacts. Change to administrative tasks. Work from home.

4.2 INITIATION OF THE MAIN STUDY

The main data collection of the TUFs-project was initiated with an explicit aim to cover three different occupational sectors: Manufacturing industry, health care and white-collar office work. This was done in order to include different types of work environments, different work tasks, different socioeconomic groups, and to include workplaces both in the public and private sector.

In total, the management of 19 different employers were contacted and invited to participate. Eight of these declined participation (three municipal health-care providers, four public employers of white-collar employees, and one private employer of white-collar employees), five did not answer (four within municipal health care and one public employer of white-collar employees), and six accepted the invitation. The most common reason for declining participation was ongoing organizational changes and ongoing activities to handle “the sick-leave problem” at the workplace.

Of the six employers that agreed to participate four were within public or municipal health care, one was a manufacturing plant, and one was an insurance company. They had their practice geographically spread out over south and middle Sweden, with a concentration to the Stockholm area. The number of employed individuals differed substantially, with the insurance company and one of the health-care facilities employing more than 1 000 individuals each, spread over several different work sites, and another of the health-care providers consisting of only two wards employing less than 50 individuals. If using the term workplace in a strict fashion, the larger employers may be considered to consist of several workplaces. However, in this thesis, the term workplace will be used to signify the different participating employers.

The approval process at the workplaces started with meeting representatives of the executive management and union representatives. At a next step, meetings were held with members of staff who would be involved in the process of reporting sick-leave spells to the project during the follow-up. At two workplaces additional information meetings were held with the prospective participants together with written information, and at four workplaces the prospective participants were informed through management and written information from the project.

4.3 STUDY DESIGN

The TUFs project was designed as case-crossover study nested within a cohort. The designs and methods used in each of the studies are summarized in Table 3.

4.3.1 Study I

Study I is a cohort study with exposure defined in a baseline questionnaire and with longitudinal follow-up of sick leave over a period of between 3 and 12 months.

4.3.2 Studies II-IV

Study II-IV are case-crossover studies of new sick-leave spells reported during the follow-up, with exposure assessed in interviews during or shortly after sick leave.

Table 3: Overview of the four studies.

	Study I	Study II	Study III	Study IV
Aim	To investigate the association between low levels of adjustment latitude and future sick leave.	To investigate whether ill individuals are more likely to take sick leave on days when they experience a lack of adjustment latitude at work.	To investigate whether recent exposure to work-related psychosocial events can trigger the decision to report sick when ill.	To investigate whether ill individuals are more likely to take sick leave on days with a lower work load than usual.
Study population	Individuals in active employment at six strategically sampled Swedish workplaces within health care, office-work and industry. (n = 3 020)	Individuals in active employment at six strategically sampled Swedish workplaces within health care, office-work and industry. (n = 3 020)	Individuals in active employment at six strategically sampled Swedish workplaces within health care, office-work and industry. (n = 3 020)	Individuals in active employment at six strategically sampled Swedish workplaces within health care, office-work and industry. (n = 3 020)
Sample size	n = 1 420	n = 546 sick-leave spells	n = 546 sick-leave spells	n = 546 sick-leave spells
Design	Prospective cohort study with 3-12 month long follow-up.	Case-crossover study of all eligible sick-leave spells during the follow-up.	Case-crossover study of all eligible sick-leave spells during the follow-up.	Case-crossover study of all eligible sick-leave spells during the follow-up.
Outcome	First new sick leave spell reported to workplace during the follow-up.	Start of a new sick-leave spell.	Start of a new sick-leave spell.	Start of a new sick-leave spell.
Exposures	Two measures of general adjustment latitude and nine specific adjustment latitude types.	Lack of adjustment latitude.	Problems in relationship with superior. Problems in relationship with colleagues. A very stressful work situation. Unpleasant work tasks. Bullying, sexual harassment, discrimination or other type of harassment.	A lower work load than usual.
Analyses	Descriptive analyses and Cox proportional hazards regression.	Descriptive analyses, Mantel-Haenszel estimation and conditional logistic regression.	Descriptive analyses and Mantel-Haenszel estimation and conditional logistic regression.	Descriptive analyses and Mantel-Haenszel estimation and conditional logistic regression.

4.4 STUDY POPULATION

Human resource staff at the participating workplaces was instructed to extract the name and address details of all employees with a contract of at least three months future employment, and who were not currently on parental leave, sick leave for more than 30 days or other long-term leave of absence. At four of the workplaces all employees at the entire workplace were considered for participation, and at one workplace specific units of the workplace were chosen. In total 3 149 employees were found, but after more detailed controls of eligibility criteria, 3 020 were considered fulfilling these.

The major occupational groups working at the health-care facilities were nurses and assistant nurses, but the workplaces also employed other occupational groups, such as physiotherapists and assistance administrators. At the manufacturing plant the largest occupational groups were process operators and machine operators, but the plant also employed for instance book-keeping assistants, mechanics and different kinds of technical specialists. Insurance specialists and insurance sales persons made out the bulk of the employees at the insurance company, but the workplace also included claims adjusters.

4.5 DATA COLLECTION AND DATA MATERIAL

All 3 020 eligible employees were sent a postal questionnaire, together with a consent form and information about the project, to their home addresses (Figure 4). Three reminders were sent out by mail to those who did not answer, the second including a new questionnaire. Those who returned the questionnaire and a filled in consent form was considered as participants in the study cohort. If a questionnaire was returned without a signed consent form they were sent a new form and reminded to send this in by mail. A total of 1 512 questionnaires were returned, however 82 did not include the signed consent form. The final study cohort included 1 430 individuals, making the participation proportion 47%. The proportion of the study population which agreed to participate differed between the occupational sectors, with a high of 61% at the manufacturing plant and a low of 36% at the health-care facilities.

The participants were then followed with respect to their sick leave during a 3-12 month long follow-up. The length of the follow-up was the same for all employees at each workplace, but varied between the different workplaces for administrative reasons.

Due to organizational changes at two of the workplaces, information on loss to follow-up (because of death, ended employment, parental leave or other leave of absence) could not be collected for all participants. In the part of the cohort with such information, 3% had a premature end of follow-up (i.e. before a sick-leave spell or end of follow-up at the workplace).

4.5.1 The baseline questionnaire

The baseline questionnaire covered background information about sex and age, health-related information such as self-rated health and long-standing illness and general work ability (modified from the first item of the Work Ability Index (123)), private life

related information such as number of children in the household and if the respondent had a partner, and work-related information such as occupational position, time of employment, and working hours. The questionnaire also included one item aimed to measure general adjustment latitude, nine items measuring specific types of adjustment latitude, and one item aimed to measure general attendance requirements. These measures were based on previous studies of the IFM (95-97, 115). An English translation of the questions can be found in Appendix 1. Data from the baseline questionnaire was used in all four studies of this thesis.

4.5.2 Sick-leave reports

All new sick-leave spells during the follow-up were reported by e-mail or fax from designated sick-leave reporters working at the six workplaces. The reports were sent in daily at all workplaces but one health-care facility, where a weekly reporting schedule was set up. At five workplaces, these were part of an already existing organization for sick-leave reporting at the workplace, and at one workplace (the insurance company) a specific organization was set up for the purpose of the TUFs-project.

The sick-leave reporters reported the start and end dates of all sick-leave spells for all employees that had been defined as eligible to participate in the project. The project administrators then extracted the information of sick-leave spells regarding participants in the project and kept sick-leave data from the unidentifiable non-participants for descriptive purposes. From the start and end dates an estimated length of the sick-leave spell was calculated, however without possibility to exclude work-free days within a spell. Furthermore, an estimated sick-leave incidence, defined as the number of sick-leave spells per 1 000 person-days, was calculated for participants and non-participants. The sick-leave reports were used in all four studies.

4.5.3 The trigger interview

Each time an eligible sick-leave spell was reported, one of two project assistants contacted the participant on sick leave to perform a telephone interview regarding exposure to potential trigger factors.

The interview consisted of background questions, concerning the reasons for taking sick leave, the time of symptom start, the time of making the decision to take sick leave, the time of contacting the workplace to report taking sick leave, and a measure of work ability at time of taking sick leave. From this and the baseline question on general work ability the percentage of general work ability at time of sick leave was calculated. The trigger interview also contained a general matrix over the past two weeks (in which the first sick-leave day, the day of reporting sick, and all workdays and non-workdays during the previous two weeks was defined) and of 21 sets of trigger questions. A telephone interview usually lasted between 30 and 60 minutes.

Each set of trigger questions followed a similar form: In an initial gate question, a definition of exposure was given and the respondents were asked to state if they had been exposed to such a situation during the last year. Subsequently, the interviewer went through a matrix of each day of the two weeks prior to sick leave, and the respondent either defined the day as exposed or as unexposed. In a final question, the

respondent was asked to estimate the number of exposed days during the last two months prior to sick leave.

An example of a complete trigger question set and an English translation of all gate questions used in the thesis can be found in Appendix 2. Data from the trigger interview are used in Studies II-IV.

4.6 STUDY SAMPLE

4.6.1 Sample in Study I

A total of 1 430 individuals answered the baseline questionnaire and sent in the consent form. Of these 10 were currently on sick leave at the time of the start of the follow-up and were therefore excluded from the study sample in study 1 (Figure 4).

4.6.2 Sample in Studies II-IV

In the case-crossover studies, the unit of analyses was the sick-leave spells. The 1 430 participants in the study cohort had a total of 1 015 reported sick-leave spells. Planned and extended spells were considered non-eligible. Except during an initial trial period, spells from an individual that had participated in three interviews already was also considered non-eligible. With these criteria, 877 of the reported spells were eligible (Figure 5).

In 679 of the spells an interview was conducted. However, 111 of these were short versions of the interview, which included no exposure information, and 22 full-length interviews which had been completed more than 14 days after the first-sick leave day were excluded at analysis. Hence the final number of full-length interviews to be used in the analyses was 546. In total, 432 individuals contributed with the included interviews and no individual contributed with more than three interviews.

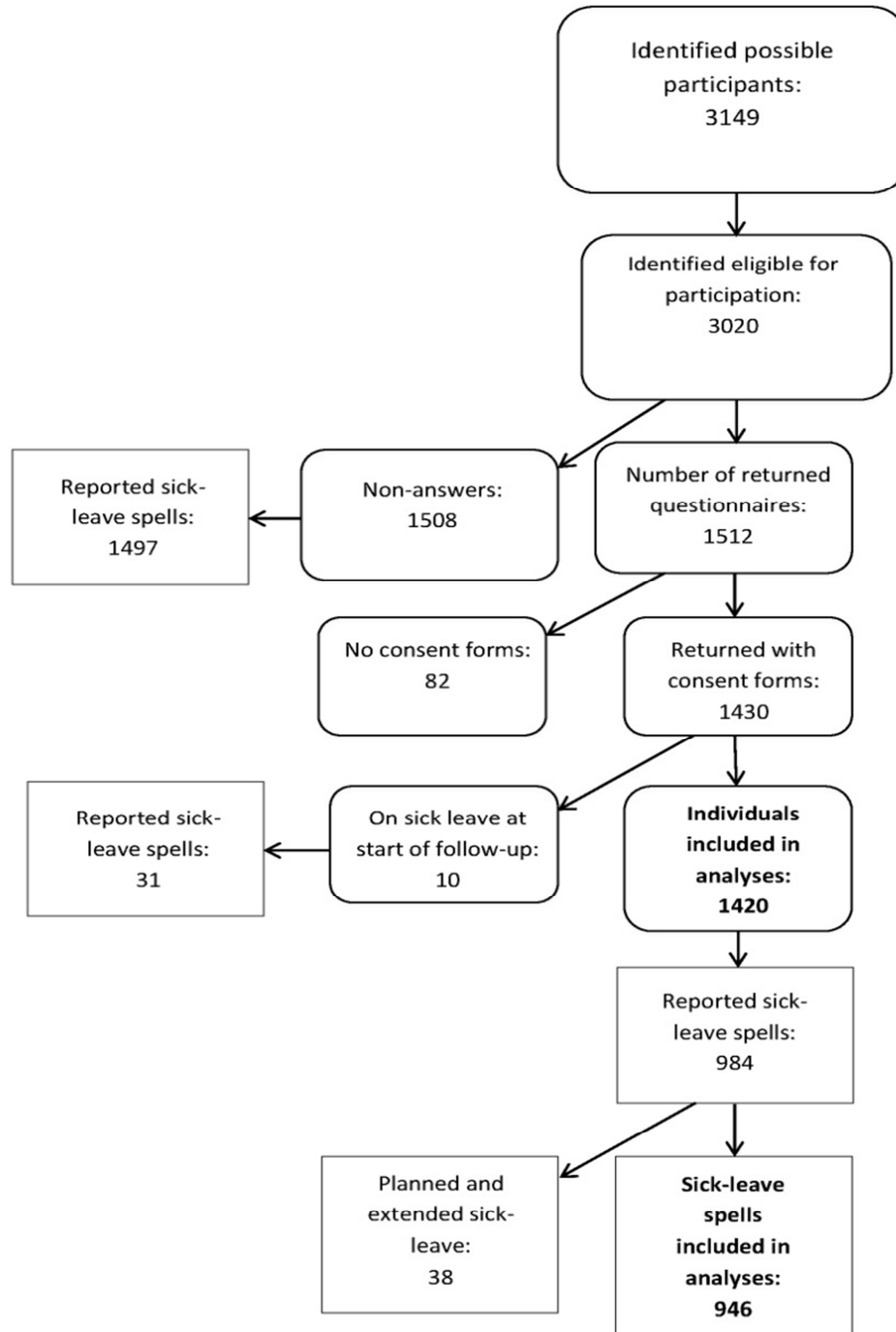


Figure 4. Flowchart of collection of data material for the cohort study (Study I).

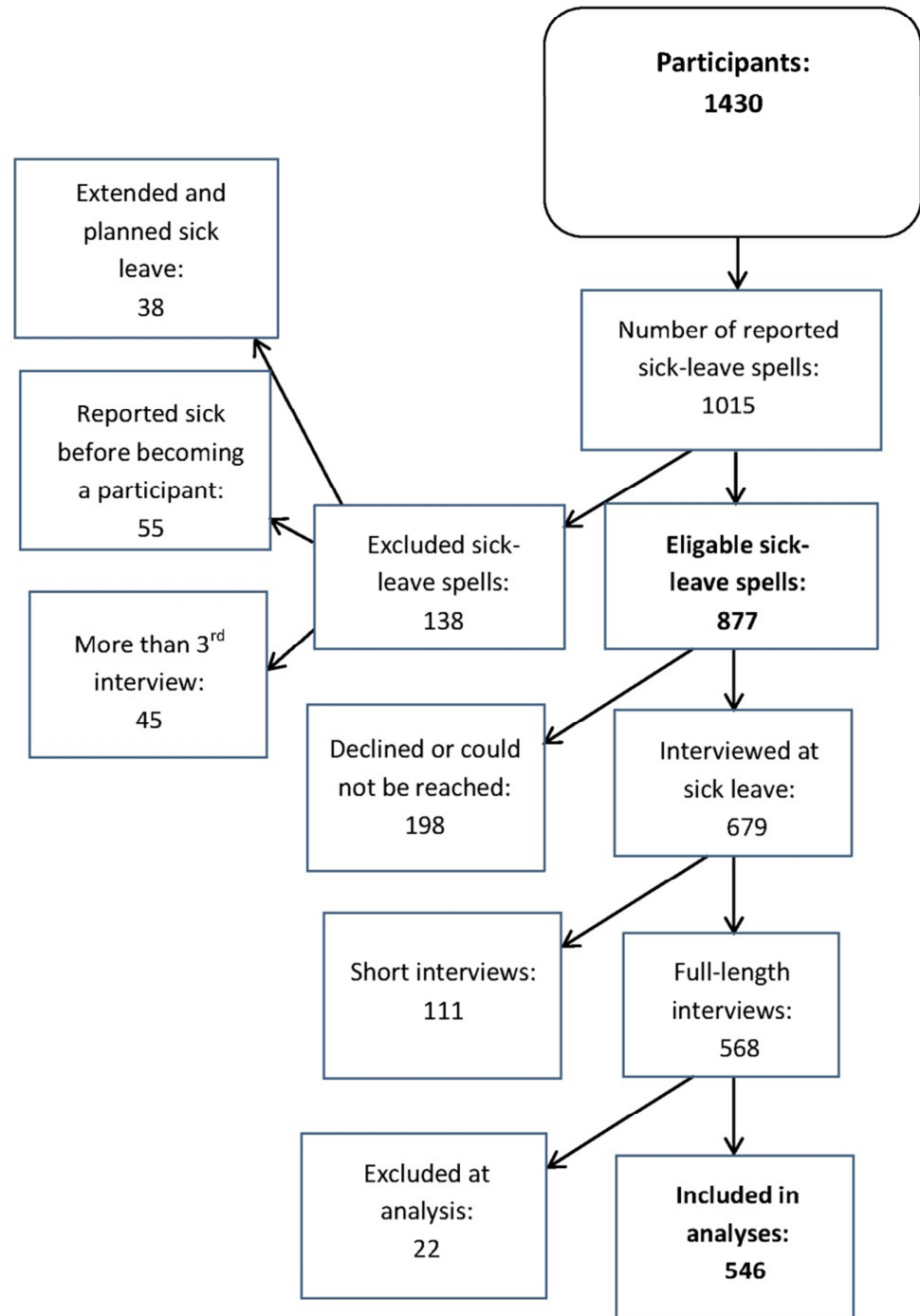


Figure 5. Flowchart of collection of data material for the case-crossover studies (Studies II-IV).

4.7 OUTCOME DEFINITION

Sick leave was defined as when a participating employee contacted their workplace and reported that they would be absent due to illness. Planned sick leave, i.e. due to planned surgery, was not included. Consecutive sick leave-spells with no workdays in between were considered as one sick-leave spell. In Study I the first sick-leave spell during the follow-up was considered as the outcome. In Studies II-IV all sick-leave spells from participants during the follow-up which met the eligibility criteria were included.

4.8 EXPOSURES

In Study I exposure was measured in the baseline questionnaire. All exposures used in Studies II-IV were collected through the trigger interview conducted during sick leave or shortly thereafter.

4.8.1 Study I

Adjustment latitude was measured with one question on general and one question measuring nine types of specific adjustment latitude. The question on general adjustment latitude read: “If you are tired, out of sorts, or have a headache, are you able to adjust your work to how you are feeling?” with the four answer categories “never”, “seldom”, “sometimes” and “often”.

Lack of general adjustment latitude was defined as answering “never” to the general question, and those answering “seldom” were defined as having a low level of adjustment latitude.

The nine types of specific adjustment latitude was assessed through a common gate question reading: “In what ways can you adjust your work if you feel tired, out of sorts, have a headache, or similar?”.

The nine specific adjustment latitude types were: “can do necessary work and postpone the rest”, “can choose what to do among my work tasks”, “can get help from other work colleagues”, “can take longer breaks”, “can shorten the workday”, “can go home and finish the work later”, “can work without being disturbed at my workplace” and “can work from home”. All specific items were answered by “yes” or “no”.

As a second measure of general adjustment latitude, the nine specific items were added to a summary score ranging from 0-9, with each “yes” corresponding to one point. The score was categorized into “few adjustment latitude types” (0-3 adjustment latitude types), an “intermediate number of adjustment latitude types” (4-6 adjustment latitude types) and “many adjustment latitude types” (7-9 adjustment latitude types).

Individuals with partly missing answers were categorized based on the answered items. Respondents which had not answered any specific item at all, but had stated in the general question that they never had adjustment latitude, were coded as having “few adjustment latitude types”.

4.8.2 Study II

In Study II, two types of *adjustment latitude* were measured, one general and one health-problem conditional.

General adjustment latitude was defined as having the possibility to change the work tasks or the workday in any of six different ways: “postpone work”, “change work tasks”, “work slower”, “take longer breaks”, “shorten the workday” or “work from home”.

Health-problem conditional adjustment latitude was defined as the respondent reporting having the possibility to adjust work to the type and level of severity of illness that he or she had when reporting sick.

For both types of adjustment latitude the respondent was considered as exposed to *lack of adjustment latitude*, on all days when access to adjustment latitude was not reported.

4.8.3 Study III

Exposure to *problems in the relationship with superior* was measured in four different sets of interview questions. Exposure to “insufficient appreciation from superior”, “quarrel or conflict with superior”, “criticism from superior” and “being disregarded or brushed aside by superior” was measured in one set each. These were combined at analyses and respondents were considered as exposed if they reported exposure in at least one of the separate items.

Two sets of interview questions measured *problems in the relationship with colleagues* (“insufficient appreciation from colleagues” and “quarrel or conflict with colleagues”). These were also combined at analyses in the same way as “problems in the relationship with superior”.

One set of interview questions measured exposure to *a very stressful work situation*. In the gate question a very stressful work situation was exemplified with “unusually much to do, a pressing deadline, more tasks, or a larger field of responsibility than usual”.

One set of interview questions measured exposure to being *discriminated, bullied, sexually harassed or harassed in other ways in the workplace*. No formal definition of the concepts were given, the exposure information was based solely on the respondents own definition of discrimination, bullying, sexual harassment and other harassment.

One set of interview questions measured exposure to *unpleasant work tasks*. In the gate question this was exemplified with “tasks which you were afraid you would not be able to perform well enough or which you, for other reasons, wish you could get out of performing”.

4.8.4 Study IV

One set of interview questions measured exposure to *a lower workload than usual*, which was exemplified by: “maybe you have had a hard time filling your work hours with work tasks because of a lower inflow of orders, being in a period between two projects, more available staff, fewer patients/clients, or having a smaller area of responsibility than usual”.

4.9 STATISTICAL ANALYSES

4.9.1 Cohort analyses

In *Study I*, the hazard ratio (HR) for having a new sick-leave spell during the follow-up was calculated using Cox proportional hazards regression. The results are presented as HRs with surrounding 95% confidence intervals (CI). The participants were followed until the first day of the first sick-leave spell or until the end of follow-up. Since information on loss to follow-up was not complete for all participants, the follow-up was not censored for this in the main analyses. However, the effect of this was explored in sub-analyses, where the part of the cohort which had complete information on loss to follow-up was included and data was censored accordingly.

A high level of adjustment latitude and many adjustment latitude types, were used as the reference categories in the respective analyses of general adjustment latitude. In the analyses of the specific adjustment latitude types, those having the specific adjustment possibility made out the reference category.

Confounders were chosen based on the previous studies of adjustment latitude and sick leave (95-97) and grouped into the four categories of demography (sex and age), health (self-rated health), private domain (household financial situation, share of housework performed and presence of children < 18 years) and work domain (attendance requirements). The final fully adjusted model was also adjusted for workplace. Effect modification was investigated by stratifying the results by sex, occupational groups, self-rated health, and long-standing illness. Separate analyses were also conducted for sick-leave spells of different lengths.

4.9.2 Case-crossover analyses

In *Studies II-IV*, the information in the two-week matrix of each set of trigger questions was used to extract exposure information regarding the respective case periods and matched control periods, and added into two-week usual frequency control periods. The two-month question was used to construct two-month usual frequency control periods. If the respondent answered no to the initial gate question concerning the past year, he or she was not asked the subsequent questions in the set. Exposure status was then assumed to be stable in all case and control periods. The exposures studied in *Studies II-IV*, together with the chosen case and control periods, are summarized in Table 4.

Table 4. Summary of exposures studied and the different case and control periods used in Study II, III and IV.

Study	Exposure	Case period	Control periods
Study II	Lack of adjustment latitude	First sick-leave day	Usual frequency of workdays during two months prior to sick leave. Usual frequency of workdays during two weeks prior to sick leave. Matched-pair control period of last workday before the case period. Matched-pair control period of last workday before the case period, controlled for workday.
	Lack of health-problem conditional adjustment latitude	First sick-leave day	Usual frequency of workdays during two months prior to sick leave. Usual frequency of workdays during two weeks prior to sick leave. Matched-pair control period of last workday before the case period. Matched-pair control period of last workday before the case period, controlled for workday.
Study III	Problems in relationship with superior	Last two workdays before sick leave	Usual frequency of last two weeks before sick leave, excluding case period. Matched-pair control period of last two workdays before case period.
	Problems in relationship with colleagues		
	Bullying, sexual harassment, discrimination or other type of harassment.		
	A very stressful work situation	First sick-leave day	Usual frequency of last two weeks before sick leave, excluding case period. Matched-pair control period of last workday before case period.
	Unpleasant work tasks		
Study IV	A lower workload than usual	First sick-leave day	Usual frequency of last two months prior to sick leave. Usual frequency of last two weeks prior to sick leave. Matched-pair control period of last workday before the case period, controlled for workday.
		First sick-leave day and previous workday	Usual frequency of last two months prior to sick leave. Usual frequency of last two weeks prior to sick leave, excluding the case period.

In *Study II*, the case period was defined as the first sick-leave day. The respondents were asked to report their expected exposure status if they would have been at work on the first sick-leave day. Two matched control periods were defined: One consisting of the last workday before the case period, and one consisting of the last workday before the case period, controlled for weekday (see Table 4).

All workdays in the two-week matrix where adjustment latitude was not reported were added into a two-week usual frequency. A two-month usual frequency was constructed by multiplying the number of monthly workdays, which was reported at baseline by two, and then subtracting the number of days with access to adjustment latitude during the previous two months (according to the two-month question in the interview).

In *Study III* the case period was defined as the last two workdays before the first sick-leave day for the exposures *problems in relationship with superior*, *problems in relationship with colleagues* and *discriminated, bullied, sexually harassed or harassed in other ways in the workplace*. A matched control period was defined as the last two workdays before the case period. If the respondent reported exposure during any of the two days in the period, he or she was assumed to be exposed. A two-week usual frequency was constructed by adding all exposed workdays during the two-week period preceding sick leave, excluding the case period. For *problems in relationship with superior* and *problems in relationship with colleagues*, which consisted of combinations of more than one gate question, the two-week usual frequency based on all days during which at least one of the exposures was reported. For the exposures *very stressful work situation* and *unpleasant work tasks* the case period was defined as the first sick-leave day. The respondents were asked to report their expected exposure status if they would have been at work on the first sick-leave day. A matched control period was defined as the last workday before the case period. The two-week usual frequency was constructed by adding all exposed workdays during the two weeks, excluding the case period.

In *Study IV*, two separate case periods were defined; one consisting of the first sick-leave day, and an extended case period consisting of the last workday before the first sick-leave day and the first sick-leave day. The respondents were asked to report their expected exposure status if they would have been at work on the first sick-leave day. One matched control period was defined, consisting of the last workday before the first sick-leave day, controlled for weekday. The extended case period was considered as exposed if the respondent reported exposure in any of the two days in the period. For both case periods, a two-week usual frequency control period was constructed by adding all exposed workdays in the two-week period preceding sick leave, excluding the case period. A two-month usual frequency was constructed based on the two-month question in the interview.

Two types of statistical analyses were employed in all three case-crossover studies. When applying the usual frequency approach (using the usual frequency of exposure during the two-week and two-month periods), the odds ratios (OR) were calculated using a Mantel-Haenszel estimator with 95% confidence intervals (CI) for sparse data (117). These reflect the ratio of the observed odds of exposure in the case period, to the expected odds of exposure.

In the matched-pair interval approach (using control information based on the matched-pair control periods), conditional logistic regression was used, with each sick-leave spell being regarded as one stratum (116, 117). The OR reflects the odds of exposure in the case period compared to in the control period.

The odds ratios are considered as estimates of the incidence rate ratio comparing exposed to unexposed conditions (124).

The interviewers used special codes to indicate when the respondent could not pinpoint the day of an exposure event. These “uncertain exposure events” were considered as exposed in all analyses except the usual frequency analyses of *problems in the relationship with a superior* and *problems in the relationship with colleagues*, since the unknown timing of the exposure events did not allow for the adding of the number of exposed days over several questions.

In all three case-crossover studies, effect modification by stable factors was investigated by stratifying the analyses by sex, age groups, occupational sectors, workplaces, self-rated health, and socioeconomic groups. Furthermore, in all studies, separate analyses were performed for different lengths of sick-leave spells. In Study II analyses were also stratified on baseline adjustment latitude, attendance requirements, having a partner, having children, the share of housework performed and previous sick-leave history. In Study IV analyses were also stratified on level of work-ability reduction at the time of taking sick leave.

The data quality was checked through several alternative analyses. Restricted analyses were performed of only first-time interviews, of only interviews where the respondent did not work the first sick-leave day, and of only spells with less than eight days and less than five days, respectively, between the first sick-leave day and completion of the interview. Analyses were also made in which exposure events marked as uncertain were coded as missing and as unexposed, respectively, and separate analyses for each of the two interviewers were performed.

In Study III alternative analyses also excluded cases reporting more than one exposure in the case period, and in both Study III and Study IV analyses stratified on whether the respondent reported experiencing symptoms prior to the case period were performed.

In Study II, an alternative analysis was made where the effect of exposure to lack of adjustment latitude in the case period was adjusted for the effect of simultaneous exposure to a very stressful work situation. This analysis was made using conditional logistic regression.

5 RESULTS

5.1 STUDY I

The main result of the analyses in Study I was that lack of, and low levels of, adjustment latitude increased the risk of sick leave during follow-up.

Both a low level of adjustment latitude and having few specific types of adjustment latitude implied increased risks of sick leave. Of the different specific types, the hazard ratio of sick leave was largest for those who could not work from home (HR 1.86, CI 1.31-2.64). The association was consistent among both sexes, but the HRs tended to be somewhat larger for men.

Stratified analyses suggested that the effect of lack of adjustment latitude was modified by occupation. Among lower non-manual other associate professionals, the risk of sick leave when exposed to lack of adjustment latitude was more than four times higher than for the unexposed individuals within the same occupational group (Table 5) . However, the confidence intervals were wide.

Table 5. Hazard ratios of sick leave with 95% confidence intervals, by groups of general adjustment latitude, measured by a single question, for the nine occupational groups. Crude estimates and after control for confounding from demographic, health, private and work domain factors (not workplace).

<i>Occupational group</i>	<i>General adjustment latitude</i>	Crude estimates (CI)	Adjusted estimates (CI)
Senior officials, managers, and professionals n=143	Never + Seldom + Sometimes <u>Often</u>	1.73 (0.66-4.48) 1	1.65 (0.61-4.45) 1
Technicians and associate professionals n=42	Never + Seldom + Sometimes <u>Often</u>	0.74 (0.17-3.14) 1	0.51 (0.10-2.66) 1
Life science and health associate professionals n=100	Never + Seldom + Sometimes <u>Often</u>	0.82 (0.25-2.66) 1	1.02 (0.30-3.51) 1
Other associate professionals (lower non-manuals) n=127	Never + Seldom + Sometimes <u>Often</u>	4.06 (1.61-10.21) 1	4.78 (1.72-13.28) 1
Other associate professionals (middle/higher non-manuals) n=304	Never + Seldom + Sometimes <u>Often</u>	1.70 (0.95-3.04) 1	1.43 (0.77-2.68) 1
Clerks n=91	Never + Seldom + Sometimes <u>Often</u>	1.03 (0.46-2.30) 1	1.09 (0.44-2.68) 1
Service workers and shop sales workers n=222	Never + Seldom + Sometimes <u>Often</u>	0.86 (0.31-2.34) 1	0.83 (0.25-2.72) 1
Craft and related trades workers n=53	Never + Seldom + Sometimes <u>Often</u>	0.80 (0.32-1.99) 1	0.70 (0.21-2.30) 1
Plant and machine operators and assemblers n=200	Never + Seldom + Sometimes <u>Often</u>	1.15 (0.42-3.12) 1	1.22 (0.44-3.34) 1

5.2 STUDY II

Of all the spells with exposure information, 8% reported not having access to any type of *adjustment latitude* during the last year. Twenty-nine per cent reported that they would not have had access to adjustment latitude on the first sick-leave day, if they would have been at work that day, and 92% reported that they would have lacked adjustment latitude enough to adjust work to the health problem they reported on that day.

A large group of respondents reported a stable exposure pattern. Of the spells with information on exposure during the previous two weeks, 46% had access to adjustment latitude both on the first sick-leave day and during all days of the previous two weeks, 19% reported lacking adjustment latitude on both the first sick-leave day and during all workdays of the previous two weeks, and 35% reported a varying frequency of exposure over the two-week period.

Of those individuals with a varying frequency of exposure, respondents had a lower tendency to take sick leave on days when they were exposed lack of adjustment latitude (OR 0.42, CI 0.26-0.68 when using a matched pair control period). The results from analyses using other control periods were similar.

Stratified analyses indicated that a decreased risk of sick leave for those exposed to lack of adjustment latitude on the first sick leave day, was found for both sexes, all occupational sectors, for different lengths of sick-leave spells, and baseline levels of attendance requirements and adjustment latitude. A decreased risk among the exposed was also found for all socioeconomic groups except for higher non-manual employees.

Adjusting the analyses for simultaneous exposure to a very stressful work situation only resulted in minimal changes of the effect estimate.

5.3 STUDY III

At least one psychosocial event was reported in the case period of 19% of the included sick-leave spells.

The respondents were more likely to take sick leave when they had been exposed to *problems in the relationship with a superior* in the previous two workdays. The odds ratio when using a two-week usual frequency control period was 3.63 (CI 1.44-9.15), and 2.33 (CI 0.60-9.02) when using a matched pair control period. Similarly, an increased risk was seen for those exposed to *problems in the relationship with colleagues* the previous two days, when using a usual frequency control period (OR 4.68, CI 1.43-15.30), but a somewhat lower effect estimate when using a matched pair control period (OR 2.50, CI 0.49-12.89).

A trigger effect was also seen for those anticipating *a very stressful work situation* on the first sick-leave day (OR 2.27, CI 1.40-3.70 for the usual frequency control period). Using a matched pair control period yielded similar results.

For exposure to *discrimination, bullying, sexual harassment or other type of harassment* and *unpleasant tasks* the point estimates were in different directions depending on the used control period and not statistically significant.

5.4 STUDY IV

In 7% of the sick-leave spells, the respondents reported that they expected *a lower workload than usual* on the first sick-leave day. Eleven per cent reported that they had been exposed to a lower workload than usual at least once during the two weeks prior to sick leave.

The respondents had a higher tendency to take sick leave on a day when they anticipated a lower workload than usual. When looking at a case period consisting of the first sick-leave day, the odds ratio of sick leave was 2.62 (CI 1.45-4.74) when using a two-week usual frequency control period, and 2.57 (CI 1.07-6.16) when using a matched control period. Analyses using an extended two-day case period were in line with those of the one day case-period.

Stratified analyses indicated increased risks in all sub-groups. Indications of effect modification by age and degree of work-ability reduction at sick leave was suggested, but the confidence intervals were wide.

6 DISCUSSION

The main aim of this thesis was to identify and estimate the effect of factors at work which influence ill individuals to take sick leave. A special focus was put on the effect of experiencing lack of adjustment latitude, work-related psychosocial events and a lower workload than usual.

The main finding of this thesis is that the psychosocial work environment appears to contain several potential triggers of sick leave. Respondents were more likely to take sick leave when they had experienced problems in workplace relationships in the previous two workdays. Furthermore, there was an increased the risk of sick leave among the respondents both when expecting a very stressful work situation and when expecting a lower workload than usual.

The effect of exposure to a lack of adjustment latitude is more ambiguous, with an increased risk shown when using a cohort design but a decreased risk was found when studied with a case-crossover design.

6.1 ASSUMPTIONS REGARDING EXPOSURES AND EFFECTS

When discussing the results of the studies and relating them to previous research, one should keep in mind that no previous studies have been found which have attempted to investigate work-related triggers of the decision to take sick leave. The case-crossover design implies different assumptions both regarding how exposure is measured and its' expected effect on the outcome compared to standard longitudinal and cross-sectional designs. The results from Studies II-IV are therefore hard to compare with results from previous studies.

In most studies of work-related psychosocial risk factors of sick leave, the exposure measured is, explicitly or implicitly, assumed to capture an overall relatively stable level of exposure. The case-crossover methodology presupposes variation in exposure over time and measurement techniques capable of capturing this.

Furthermore, in most previous studies it is not specified whether the effect of exposure on sick leave is assumed to be long-lasting or transient. The previous studies of IFM are an exception in that Johansson and colleagues clearly state that the concepts within the model are assumed to have an effect *at the moment of being ill* (95). However, whether such a transient effect exists cannot be investigated with standard longitudinal or cross-sectional designs. The effects on sick leave assessed in previous studies may be the sum of both transient and long-lasting effects, whereas case-crossover studies are aimed at studying transient effects separate of long-lasting effects (125). Studies which assume that exposure affect sick leave through stress/health also imply that the induction time is longer than if exposure affects the decision to take sick leave when ill. Identification of an immediate transient effect does not exclude that there may exist a long-lasting effect on sick leave from exposure, and such an effect may even modify the found immediate transient effect on sick leave (116).

The many previous longitudinal and cross-sectional studies made of work-related risk factors of sick leave have answered differently posed research questions than the ones posed in Studies II-IV. They have tried to estimate the change in the risk of sick leave, associated with going from being generally unexposed, to being generally exposed, answering the question “why did these people take sick leave?” The case-crossover studies presented in this thesis, estimate the change in risk associated with going from being temporarily unexposed to being temporarily exposed, answering the question “why did these people take sick leave now?” (126).

The next paragraphs will consider the reported results as in line or not in line with previous studies which have often measured an assumed general level of exposure, keeping the basic differences in the underlying research question in mind.

6.2 ADJUSTMENT LATITUDE

The higher risk of sick leave found among individuals with low levels of adjustment latitude in Study I is in line with the previous studies made of adjustment latitude (95, 96). However, the present study found increased risks of sick leave among respondents with both low and intermediate levels of adjustment latitude, whereas the previous longitudinal study only found increased risks for the intermediate exposure group (95).

The measures of adjustment latitude used in Study I differ somewhat from the measures used in previous studies. In the cross-sectional study (96) three answer alternatives were used for the single question regarding general adjustment latitude, and these were subsequently dichotomized at analysis. Study I used four answer alternatives which were analysed separately. We used nine specific types of adjustment latitude, which is congruent with two of the previous studies, however in the previous longitudinal study seven specific types were measured (95, 97, 115). The two specific types of adjustment latitude which were added were “can work without being disturbed at my workplace” and “can work from home”. Including the item “work from home” which is fairly uncommon in many occupations and which according to Study I appeared to be strongly associated with future sick leave, may have resulted in a more selected reference group in Study I compared to the previous longitudinal study.

Furthermore, the previous studies of adjustment latitude and sick leave differs from Study I and Study II in that they are based on random samples of the Swedish population and of the population of Stockholm, respectively. The variation in exposure, both the general level and different the specific types, is likely to be lesser in Studies I and II. However, the study sample in TUFSS is by no means a homogenous one. Another important difference is that previous studies excluded all individuals with no reported previous sick leave or sickness attendance. The explanation for this procedure was that these individuals have not made the choice of reporting sick or not and therefore have not had to consider their illness flexibility (95). The authors do not explain what effect they expect that including such individuals would have on the results, but the use of the term “have not had to consider” implies that it might increase the risk of misclassification of exposure (95). Such a restriction has not been used in Study I. Sick leave is a common consequence of illness, experienced by most people over a longer period of time, and it is likely that an individual with neither any reported

sick leave nor any sickness attendance in the last twelve months do have previous illness experience to relate to. Furthermore, imagining how work could be adjusted *if* one was ill should not be seen as impossible. What effect this may have on the results, and its' effects in relation to the previous studies, will be discussed under methodological considerations.

The results concerning the specific types of adjustment latitude indicated that five of the nine different types implied an increased risk of future sick leave after adjustment for potential confounders. In previous studies of adjustment latitude, measures of specific types of adjustment possibilities were only used to construct summary indexes. The increased risks found for those not having the possibility to “shorten the workday” and for those not able to “go home and finish later” can be regarded as in line with the previous studies of the effect of work-time control on sick leave (89, 127).

The overall view of adjustment latitude is however a more complicated one. The results from the case-crossover analyses in Study II indicated that exposure to lack of adjustment latitude was very stable in many of the participants, with 19% reporting being constantly exposed, and 46% being constantly unexposed, during the last two weeks. The previous studies on adjustment latitude have either used broad answering categories like “seldom” and “sometimes/often” when measuring general adjustment latitude, or have used summary index measures of different types of adjustment latitude as measurements of general level of adjustment latitude. This implies difficulties estimating the daily exposure frequency to lack of adjustment latitude. However, in Study I, 56% of all respondents reported that they seldom or sometimes had adjustment latitude, which would suggest variation.

Among those spells where variations in exposure was reported (35% of sick-leave spells included in the analyses), there was a decreased risk of sick leave on days with lack of adjustment latitude. This result held even when adjustment latitude was specifically defined as being enough to adjust work to the reported health problem. Although this is the first study made which investigates the immediate transient effect of lack of adjustment latitude, it is not in line with previous studies of adjustment latitude and it is not in line with the general theoretical assumptions of the IFM (95).

6.2.1 Possible explanations for the associations between lack of adjustment latitude and sick leave

In general, the IFM does not imply that adjustment latitude varies from day to day (95), and long-lasting and immediate transient effects in different directions are quite possible, as mentioned above. Yet, the theoretical definition of adjustment latitude, having possibilities to adjust work when ill, implies that it should mainly exercise its' effect when it is needed, i.e. at the time of illness or disease. The differing effects found in Study I and Study II could indicate that the measures of adjustment latitude may capture more than one latent aspect of the work environment. It may capture long-lasting effects of an inflexible work environment, which may exercise its effect through stress and health (Figure 2a), through satisfaction and motivation (Figure 2b), or through another unknown mechanism. Among individuals with day-to-day variations in adjustment latitude, access to adjustment latitude on the first sick-leave day may

capture possibilities to adjust work to being absent as well as adjust it to working with illness, which would explain the decreased risk of sick leave found in Study II. Finally, among a group of employees which are stably exposed to lack of adjustment latitude, it may also have a triggering effect on the need to take sick leave when ill, but this can however not be captured with a case-crossover design.

Stratified analyses in Study I suggested that the increased risk of sick leave among those with lack of adjustment latitude was modified by type of occupation. This implies that adjustment latitude might have different meanings in different occupations. Nevertheless, when stratifying the case-crossover analyses on occupational groups, the point estimates indicated decreased risks of sick leave when exposed to lack of adjustment latitude on the first sick-leave day for all occupational groups, although with wide confidence intervals for some of the smaller occupational groups.

6.3 PSYCHOSOCIAL EVENTS AT WORK

The increased risks of sick leave when exposed to problems in the relationship with a superior and with colleagues the previous workdays, are in line with a cross-sectional study of factory workers, by Messing and colleagues (128), which found an association between having a poor relationship with colleagues or superiors and a higher level of sick leave.

The results for exposure to problems in the relationship with superior can be considered as in line with the previous studies which indicate that exposure to low management quality increase the risk of sick leave (30, 85, 86).

The results can also be considered as in line with the previous studies which have found an association between low social support at work and higher levels of sick leave,(46, 47) but in general the results from studies of social support are inconclusive (27, 42, 46, 47, 52-54, 56, 57). The few studies in which social support from supervisors and colleagues have been studied separately are not unanimous either, and, if at all, suggest an association between low social support from superiors and sick leave (30, 57, 85, 86).

However, the questions used to measure for problems in the relationship with superiors and colleagues in Study III differ from the previous studies the effects of social support and of low management quality, and may capture different situations.

The results from Study III also indicate an increased risk of sick leave when expecting a very stressful work situation. The examples given in the gate question refers to quantitative demands, having more tasks or a larger area of responsibility. This may both be related to psychological and physical demands at work. In general, previous results regarding the effect of exposure to psychological and physical work demands on sick leave are inconclusive (27, 31, 36, 42, 46, 47).

The study also indicated a very low exposure frequency of bullying, discrimination, sexual harassment or other types of harassment. The power was too low to investigate whether these factors imposed a trigger effect on sick leave.

Additionally, no statistically significant association with sick leave was seen for unpleasant work tasks. This exposure was mainly operationalized based on the focus-group study and no previous studies of similar factors have been found.

6.3.1 Possible explanations for the associations between psychosocial events at work and sick leave

Interpreted in the framework of IFM, the results of Study III show that recently experienced problems in the relationships with superiors or colleagues may act as absence incentives, affecting the part of the motivational structure defining what individuals *want to* do, which increase the risk of taking sick leave when ill. Such an interpretation would also be in line with the more general concepts of Berglind (105). However, one may also consider the decision to taking sick leave after having been exposed to problems in workplace relationships as a way to lower inputs and restore equity in a way that would be in line with Adams Equity Theory (106) and with ERI (59). The two explanations do not necessarily exclude each other. A third explanation is that the exposure to psychosocial events can trigger illness, in a way that would be in line with the stress hypothesis. That psychosocial events at work may cause a stress reaction which increase the susceptibility to for instance the common cold virus is in line with previous research (91, 92), but the short time interval between exposure and illness symptoms in the present in this study make this explanation rather unlikely. Finally, a fourth possible explanation imply that the illness experienced by the individual may have had an effect on the exposure, either the actual exposure or the reporting of exposure. These possible biases will be considered under methodological considerations.

6.4 A LOWER WORKLOAD THAN USUAL

The results indicate an increased risk of sick leave on days with an expected lower workload than usual. Previous studies of a low workload and sick leave are scarce. In the studies of psychological demands, some previous studies have indicated an low psychological demands and higher levels of sick leave (27, 48, 49). Previous studies have also indicated an association between low levels of attendance requirements at work increase and high levels of sick leave (95, 96). However, the effect of daily variations in exposure is of course something entirely different.

6.4.1 Possible explanations for the association between a lower workload than usual and sick leave

If interpreted in the terms of IFM, a lower workload than usual may both be considered as an absence incentive and as a lack of attendance requirements (95). This implies a question of through which part of the motivational structure that the exposure has its' effect. If it is through the *want to* part of motivation, this may imply that a lower workload than usual causes a lack of stimulation at work. If it is through the *ought to* part of motivation, it may be interpreted as a more calculative act, where ill individuals do not feel the same normative pressure of attending work despite the illness, when the workload is unusually low. Both a lower workload than usual and exposure to psychosocial events at work may lower the threshold of work ability reduction at which an individual feels the need to report sick, in a way that would be in line with

Nicholson's (93) ideas. The results may also be interpreted as an indication of individuals trying to plan their sick leave to periods during which it does the least harm to the rest of workplace, again when the attendance requirements are lower. Finally, the results may also be due to an explicit encouragement by superiors for employees to take the chance to recuperate when the work load is lower than usual. The two last interpretations are in line with the original aspect of a low workload which was brought up in the focus-group study in the design stage of the TUFs-project. If interpreted in the terms of Nicholson and Johns (111), this would suggest that the psychological contract of the workplaces where these individuals work allow a higher level of sick leave when the workload is low.

Lack of attendance requirements may thus explain both the found increased risk of sick leave when exposed to a lower workload than usual and the increased risk when exposed to *access to* adjustment latitude. However it appears as if the concepts capture somewhat different aspects of lack of attendance requirements since only 7% of all the cases for which access to general adjustment latitude was reported on the first sick-leave day also reported a lower workload than usual on the first sick-leave day.

6.5 TO WHAT EXTENT IS THE ILLNESS FLEXIBILITY MODEL APPLICABLE?

This thesis has been performed with the IFM as its' theoretical base. It is a fairly new and to some extents untested theoretical model. The results presented here have shed some light on what can be regarded as strengths and weaknesses of the IFM in describing the factors which influence the decision-making process preceding sick leave.

The different results from the cohort and the case-crossover studies of lack of adjustment latitude and sick leave suggest that adjustment latitude may have its' effect through more than one mechanism. This implies that the position of adjustment latitude in the IFM may be over-simplified. The relationship between adjustment latitude and the other concepts in the model, specifically health and attendance requirements, need to be further specified.

Work-related psychosocial events are not really explicitly positioned in the IFM. In this thesis they are considered as constituting examples of absence incentives. However, in some instances the opposite situations to some of the psychosocial events, for instance a high level of social support at work, are described as attendance incentives by Johansson (95).

Considering the vast previous research on the relationship between physical and psychological work demands and sick leave it is surprisingly unclear where an individual's workload or work demands belong in the IFM (95). In this thesis a very stressful work situation is considered as an absence incentive and a lower workload than usual is considered both as an absence incentive and as a lack of attendance requirements. However, Johansson (95) states: "*work ability in the model of illness flexibility is determined by individual factors: health/capacity and knowledge/skills and the work condition: adjustment latitude*" (p. 11) . In this sentence, Johansson implies

that demands or workload have an indirect effect through adjustment latitude. If so, a high workload, given the same adjustment latitude, could be assumed to result in lower work ability, in turn increasing the risk of sick leave. The presented results for a very stressful work situation (study III) would be in line with that. Reasoning in the same way, a low workload would increase work ability and decrease the risk of sick leave, which is contradictory to the trigger effect of a lower workload than usual presented in study IV.

6.6 PERSONAL AND HOME-RELATED TRIGGERS OF SICK LEAVE

Several previous studies exist which indicate that personal or home-related factors, such as a high domestic workload or a negative interference between the work and family domain, and stressful private life events, such as the death of a significant other, being the victim of physical or psychological abuse, or experiencing a divorce may have an effect on sick leave (37, 55, 129-138). Several potential home-related triggers were measured in the TUFs-project. The results indicated very low exposure frequency and no indications of increased risks could be seen. However, this does not necessarily imply that home- or private-life factors cannot trigger sick leave. Furthermore, it is quite possible that individuals exposed to private-life triggers may have been less inclined to participate in the study.

6.7 METHODOLOGICAL CONSIDERATIONS

6.7.1 Choice of design and analytical method

The aim of *Study I, the cohort study*, was to investigate the association between low levels of adjustment latitude and future sick leave. Although the general focus of the thesis is on investigating triggering effects, the relatively few studies published on the association between lack of adjustment latitude and sick leave, and the availability of baseline data in the TUFs-project, prompted an investigation of the association in a prospective cohort study. This would also give the opportunity to compare the results with previously made cross-sectional and cohort studies, and to investigate if the general level exposure to lack of adjustment latitude modified the potential trigger effect from lack adjustment latitude at the time of sick leave (95, 96).

The data was analysed with Cox proportional hazards regression. Logistic regression and Poisson regression are commonly used alternatives in longitudinal studies of sick leave. Since logistic regression assumes equal follow-up lengths for all subjects in the cohort, and the TUFs-project both included different follow-up lengths and different follow-up starting points, this analytical method was not appropriate (139). Poisson regression models count outcome data, which implies a somewhat different research question, whether exposure increase the number of sick-leave spells or the number of sick-leave days (140). It was not part of the stated aim of the thesis to investigate if exposure to low levels of adjustment latitude at work would increase the duration of sick-leave. To use the number of sick-leave days as the outcome also require detailed information on the length of each spell. In TUFs only the start and end dates of a sick-leave spell were reported from the workplaces, without possibility to exclude work-free days. The crudeness of the outcome measure implies that the number of sick-leave days

may be overestimated among individuals in shift work, which, if related to exposure to lack of adjustment latitude, might cause overestimated rate ratios.

The traditional Cox model analyses time to the first outcome event although, in the TUFSS-project, all sick-leave spells for the individuals during the follow-up period was collected. This can clearly be regarded as underutilization of the collected data. Christensen and colleagues (140) suggested in a paper from 2005 that data of repeated sick-leave spells should be analysed with a Cox model including a gamma-distributed frailty. In alternative analyses of study I such a model was used. In general, the results were very similar to those presented in the paper. There are two main reasons for not using it in the main analyses: firstly, the use of all recorded sick-leave spells increases the problem involved with the incomplete information on premature end of follow-up which has been mentioned above, since we use more of the available follow-up time. Secondly, as has been mentioned as well, the estimated duration of the sick-leave spell may include work-free days, which would make us underestimate the person-time under risk for the period following a sick-leave spell, especially for participants who work shifts.

The Cox model assumes that the ratio of the hazards in the exposed and unexposed groups is constant over the follow-up time (139). If this condition is not fulfilled it can seriously bias the results. The proportional hazards assumption was checked both by including time-dependant versions of all the covariates in the models and through the ASSESS statement in SAS, which is derived from cumulative sums of martingale residuals over follow-up times. None of the methods indicated a violation of the proportionality assumption.

The hazard of sick leave may be assumed to be different at different seasons of the year, and the start of follow-up was initiated at different seasons in different workplaces. At the insurance company, follow-up was limited to a “high risk” season (November through February). Since employees at the insurance company make out a large part of the group who were unexposed to lack of adjustment latitude, the combined effect of season and length of follow-up may to some extent result in an underestimated hazard ratio. This was however adjusted for by the adjustment for workplace (i.e. date for start of follow-up and length of follow-up) in the final model.

The aims of *Studies II-IV, the case-crossover studies*, were to investigate if exposure to lack of adjustment latitude, work-related psychosocial events, and a lower workload than usual could trigger the decision to take sick-leave. For this purpose a case-crossover design was applied. Alternative designs such as a cohort or a case-control design would be more resource demanding and would imply risks of unmeasured confounding from stable risk factors (125).

In their seminal work from 2000, Maclure and Mittleman summarize the assumptions when studying triggers (116):

Cases that are *acute*, in the sense that the onset of the outcome is abrupt and easily definable, are best suited to be studied in case-crossover studies. Sick leave is acute in the sense that it is easy to define that one day an individual is on sick leave, as opposed

the previous day when he or she was not on sick leave. However, one could discuss the importance of the time when the *decision* to take sick leave was made. The exposures studied in study II-IV are assumed to affect the individual when making the decision to take sick leave. This decision may have been made several days before the actual first sick-leave day, which affects the positioning of the theoretical hazard periods. Nevertheless, in the trigger interview the respondents reported the day of deciding to take sick leave as well as their first sick leave day, and in a majority of the interviews these were one and the same.

At least some subjects must have *crossed over* at least once from lower to higher exposure or vice versa. The results from the focus-group study indicated variations over time in exposure to lack of adjustment latitude, psychosocial events at work, work load and work tasks. In retrospect, lack of adjustment latitude did not indicate as much day-to-day variation as expected. However, the design does not specifically require that crossover happens from one day to another.

At least one of the effects of exposure must be *transient*. This does however not imply that the exposure should only have a transient effect, as has been discussed previously under the section “assumptions about exposures and effects”. The theoretical definition of adjustment latitude, having possibilities to adjust work when ill, suggested a transient effect. Based on the Illness Flexibility Model and other theories of sick leave from a coping perspective, we expected the exposures related to work tasks to have an effect if present on the first sick-leave day, which would indicate that the individual may use sick leave as a means to cope with these tasks (95, 96, 114). On the other hand, it is likely that exposures concerning relationships with other individuals have to have happened to have an effect, and therefore a case period of the last two workdays before the sick leave was chosen. The number of exposure events reported during these chosen case periods, as compared to the rest of the days in the two-week period also indicated the assumptions were correct.

The two employed statistical methods, Mantel-Haenszel estimates and conditional logistic regression, are the ones suggested in the case-crossover literature (116, 118). However, the literature also suggests sampling multiple matched control periods for increased robustness in results (tighter confidence intervals) (124). None of the studies II-IV uses such an analytical approach, and this may be considered as a limitation. In the design the TUFs-project and the trigger interview measuring exposure, the primary focus was on handling the possibility of recurring weekly cycles in exposure. The weekday controlled analysis does not allow for multiple matched pair analyses. Extending the period of measuring day-to-day exposure to allow for analysing multiple matched control periods controlled for weekday would implicate an increased risk of recall problems.

6.7.2 Information bias

In *Study I, the cohort study*, 86% of all reported sick-leave spells included in the Cox regression were interviewed for the purpose of the case-crossover study. Through the interview they confirmed their sick-leave status. This implies that the specificity of the outcome measure can be considered high.

However, at one of the workplaces, where an organisation for reporting sick-leave spells was set up specifically for the TUFSS-project, the project had the possibility to compare sick-leave spells reported to the project to the workplace registers at the end of the follow-up. In total, the number of sick-leave spells was equal over the period; however, some sick-leave spells were only reported to the project and some only found in the workplace register. Those spells which were solely reported to the project were in approximately half of the instances double-checked through a telephone interview in which sick leave was confirmed by the respondent. One possible explanation to the lack of these spells in the workplace registers could be that those respondents after the interview decided on taking a day of vacation instead. When considering the spells that were only reported to the workplace register and not to the project, these followed no particular pattern with respect to respondents' background characteristics or reported sick-leave spells. The individuals, whom the spells concerned, did however appear to have somewhat higher level of adjustment latitude than the respondents whose spells were reported to the project. Adding the solely administratively registered spells to the analyses resulted in slightly lowered effect estimates. The misclassification of outcome status is most likely less severe at the other workplaces where the reporting of sick-leave spells were a part of an already existing organisation for staff management.

Misclassification of exposure is mainly a problem if related to outcome. If individuals with little recent experience of having to consider their adjustment possibilities at work are worse at estimating their adjustment latitude this may bias the results, possibly causing overestimated effects estimates. However, when the group of individuals with no prior sick leave or no prior sickness attendance during the previous 12 months were excluded from the analyses, this yielded results that were very similar to those reported in the main results of the study.

When constructing the summary score measure of general adjustment latitude, respondents who did not answer all items were classified on the basis of the items answered, in effect assuming that the respondents would have answered no to the unanswered items. This may infer misclassification of exposure, underestimating the mean number of adjustment types in the study group. In alternative analyses, we assumed that respondents would have answered yes to all unanswered items. This analysis implied that 8% of the respondents changed exposure groups, and 7% changed from the highly exposed group (few adjustment latitude types) to the reference group (many adjustment latitude types). Nevertheless, the resulting effect estimates of the regression were very similar to those reported in the main results. Similarly, individuals who did not answer any sub-questions, but answered no to the general question of adjustment latitude were classified as having few adjustment latitude types in the main analyses. In alternative analyses these individuals were excluded, but the results were similar.

In *Studies II-IV, the case-crossover studies*, the specificity of the outcome can be regarded high since the participants confirmed their sick leave at each interview. The sensitivity problems discussed above for the cohort study may affect the case-crossover studies in terms of selection, which will be discussed under a separate heading. The time of onset of the outcome, the start of the first sick-leave day, was measured in detail in the interview. The respondents reported when they decided to take sick leave

and when they contacted the workplace to report taking sick leave. Those individuals who worked part of their first sick-leave day, also reported when they left the workplace to go on sick leave.

To minimize general memory problems, efforts were made to make the recall period as short as possible, and the median time from the first day of sick leave to the completion of the interview was two days. The use of exposure information which had been coded as uncertain in timing may indicate a risk of misclassification. However, separate analyses where such events were coded as missing and as unexposed, respectively, resulted in effect estimates of similar magnitude and direction as those reported in the main results of Study II-IV.

Recall bias, implying that the reporting of exposure is affected by the outcome, is a common problem in retrospective studies. In the case-crossover studies it implies that individuals' reports of exposure were affected by the fact that they were on sick leave. In an open-ended question at the beginning of the interview, the respondents were asked to report their reasons for reporting sick other than their reported health problem. In 78% of the included interviews, respondents reported that no other circumstances than the health problems had been of importance. Neither the interviewers nor the respondents were informed of the general assumptions regarding the length of the hazard periods, but were instead instructed to pay equal attention to each day in the matrix covering the two weeks prior to the start of the sick-leave spell. A possible approach to obtain control information which would be less likely to be influenced by the respondents' outcome status, would have been to re-contact the respondent after return to work and obtain future control information (116, 120). This method was not used in the TUFS-project, mainly due to resource constraints, and since the initial interview at sick leave already was considered long and burdensome by some respondents.

An important part of case-crossover design concerns establishing the correct hazard period and thereby the correct case period. Underestimation the hazard period could imply that one samples adjacent control periods which in fact include part of the true hazard period, leading to diluted effect estimates. If one instead overestimates the hazard period this would imply including time in the case period during which there is no effect of exposure. This would also lead to diluted effect estimates.

For the exposures lack of adjustment latitude, very stressful work situation, unpleasant work tasks and a lower workload than usual, the case period was defined as the first sick-leave day. This implies that the case period is placed after the onset of the outcome, which can be considered quite unorthodox in methodological terms. However, in practice, the information gathered is a retrospective estimation of what the respondents expected of the work situation when making the decision to take sick leave, i.e. before the onset of outcome. The information in the control periods were on the other hand assessed retrospectively regarding experienced workdays. A way to handle this incongruence between exposure measurements would have been to also collect control information on expected exposure, at baseline or during a later interview. This was not done for any of the exposures in Study II-IV, and it may be regarded as a limitation of the studies.

A common approach to address the presence and magnitude of potential information bias in case-crossover studies is to employ different types of control information and compare the results (116, 124). All three case-crossover studies in this thesis use at least two different types of control information. In study II, where the results were not in the direction one would expect from prior studies and from the theoretical assumptions of the IFM (95, 96), the possible risk of information bias was therefore investigated further through the use of four different control periods. In general, the results were similar across types of control information.

6.7.3 Confounding

The level and types of available adjustment latitude is innately related to the nature of an occupation, and with the specific work tasks performed in an occupation. Furthermore, there is a previously reported strong socioeconomic gradient in sick leave (141-143). This may affect the association between adjustment latitude and sick leave found in *Study I, the cohort study*, in several different ways: Firstly, there may be a health-related selection into occupations with different levels of adjustment latitude. In the analyses presented in Study I, adjustment for health was done both using a measure of self-rated health and long-standing illness, trying to capture different aspects of an individual's health. The differences in results between the two alternative analyses were very small. Secondly, socioeconomic status may be related other risk factors for sick leave than reduced health. Some of these risk factors may have been captured through the adjustment for household financial situation, share of housework performed, and presence of children under 18. The alternative analyses which were adjusted for socioeconomic status yielded very similar effect estimates as those presented. Thirdly, the occupation and the work environment may include several other risk factors of sick leave which are also related to adjustment latitude. However, as has been discussed above such factors have mainly been assumed to have their effect on sick leave through health, and consequently some of their effect should have been adjusted for in Study I through the adjustment for self-rated health and long-standing illness, respectively, but the risk of residual confounding should be kept in mind when interpreting the results.

Adjusting the analyses for type of occupation would in essence change the comparisons, from large objective differences between heterogeneous occupational groups, to smaller subjective differences within homogeneous occupations. Furthermore, the results from the analyses stratified by occupational group indicate that the effect of lack of adjustment latitude on sick leave is modified rather than confounded by type of occupation (see Table 5). Instead, the final model has been adjusted for workplace, assuming it to be a measure, albeit a crude one, of local norms and organisation-specific differences.

If one considers adjustment latitude as a more general aspect of work flexibility, it opens for the fact that it may be used as a form of reward for productivity. In that sense, adjustment latitude may be restricted for individuals with low productivity, perhaps caused by lacking motivation. This opens for a possible pathway from motivation to adjustment latitude to sick leave, which has not been investigated in study I. However, it is perhaps just as likely that motivation and satisfaction in parts modify the effect of adjustment latitude on sick leave. Investigating such effects was deemed as outside the

scope of the paper, but the non-existing information on satisfaction and motivation is a limitation of the study.

It is important to note that the different types of adjustment latitude available to an employee are strongly related to the type of job he or she performs. It is also possible that the effect of different types available will interact with each other, implying that certain combinations of adjustment types will be more potent in reducing the risk of subsequent sick leave. The statistical power of the study has not permitted analyses of such interaction. When interpreting the effects of the specific adjustment types it is also possible that these will interact with the type of health problem that the individual experiences, so that certain adjustment types will have a strong effect on the need for sick leave for certain health problems but no effect for others. These types of diagnosis-specific effects have unfortunately not been investigated due to power limitations.

In *Studies II-IV, the case-crossover studies*, the self-matching element of the case-crossover design eliminates confounding from stable risk factors (116). Nevertheless, the risk of confounding from other triggers is still important to assess (116).

Illness can be assumed to be a strong trigger of the decision to take sick-leave. All of the respondents who were interviewed reported that they were ill when taking sick leave. Since all the cases were exposed to illness in the case window, it is impossible to estimate the effect of exposure to the studied triggers independently of illness. However, if the found effects were only an effect of illness, exposure to the studied triggers would be equally distributed between the case and control periods. Clearly, this is not the case for all studied exposures.

The question is: To what an extent can illness be expected to generally co-vary with the studied exposures? In the case of adjustment latitude there is a definite possibility that adjustment latitude is given those who are ill. It was handled by creation of a second trigger question set in which lack of adjustment was defined as not enough to adjust work to the reported health problem. In this way the level of illness was implicitly held constant in the case and control periods.

When studying psychosocial events, specifically those concerning problems in workplace relationships, there is a risk of illness influencing both the *occurrence* of psychosocial events and the *experience* of events as unpleasant. On the first note, it is not clear how this might affect the results, an ill individual may both be more and less inclined to engage in conflicts with colleagues or superiors. On the second note, illness symptoms could increase the tendency to report exposure to psychosocial events in the case period, resulting in an overestimated effect. However, analyses where interviews in which illness symptoms was reported prior to the case period were excluded, suggested that there was still increased risk estimates of the same direction and similar magnitude as those reported in the main analyses.

As no previous studies investigating triggers of sick leave have been found, the risk of confounding from other triggers has been assessed based on the triggers studied in the TUFSS-project. In 31% of the interviews, more than one trigger exposure was reported in the any of respective case periods. However, a large part of these considered

exposure to lack of health-problem conditional adjustment latitude and one other exposure. In general, the statistical power limits the possibilities to investigate confounding between trigger exposures, and also to investigate interaction effects of multiple exposures.

6.7.4 Selection bias and generalizability

The workplaces included in the TUFs-project, and thereby the study sample, are a result of a strategic sampling procedure. The employees are in no way representative of the working population in Sweden, and this should be kept in mind when drawing conclusions from the findings.

Since the data in the TUFs-project come from six different workplaces it is possible that individuals within one workplace are more similar than individuals from different workplaces. It is also possible that some of the work-related factors studied, have a contextual effect on sick leave on work-unit, workplace or sector-level. Unfortunately, no data is available on work-unit level in TUFs and the number of workplaces and sectors are too few to make multilevel modelling useful (144). However, adjusting for workplace in a regular regression model, as was done in the final model in study I, may imply that the standard errors are underestimated, causing too narrow confidence intervals (144).

The non-participation proportion in *Study I, the cohort study*, was 53%. Non-participation differed between the occupational sectors, being lowest at the manufacturing industry. The management and occupational health service staff at this workplace had a strong commitment to work-environment and sick-leave related questions, which may have affected the participation.

For 80% of the non-participants (four of the six participating workplaces), information was available regarding sex and age. The two workplaces where no information on the age and sex of the non-participants was available were both health-care facilities. Of the non-participants (with information available), 56% were women. The age span was 19 to 71 years with a median age of 42 years, which can be compared to 56% women and a median age of 45 years among participants. The sick-leave incidence among the non-participants was 4.30 spells/1 000 person-days, to be compared to 2.85 spells/1 000 person-days among participants.

The non-participation implies a selection of individuals into the study cohort. The higher sick-leave incidence among the non-participants is expected, and may be related to both at health-related selection into the study and an effect of individuals with high levels of sick leave, perhaps to some extent unjustified sick leave, not wanting be contacted during sick leave. To invalidate the results in Study I, participation would have to be differential due to exposure, and high levels instead of low levels of adjustment latitude would have to be related to sick leave among the non-participants.

In total, 432 individuals contributed to the 546 sick-leave spells analysed in *Studies II-IV, the case-crossover studies*. If this implies a dependency between spells, which may slightly underestimate the variance and possibly affect the risk estimates (145).

However, in none of the studies are the exposed cases confined to spells from a small selected group of participants. There was a median of 79 days between first and second interviews and 88 days between second and third interviews. When restricting the analyses to only first-time interviews, the results did not change markedly.

In 111 of the 679 performed interviews, only a short interview, with no exposure information was conducted. In 198 spells the respondents declined or could not be reached for an interview. Sixty-nine percent of the individuals who participated in a short interview, and 52% of those individuals who declined or could not be reached, contributed with at least one full-length interview during the follow-up for another sick-leave spell.

The non-participation on cohort and interview level mainly affects the generalizability of the results in case-crossover studies. Especially for lack of adjustment latitude, where a surprising decreased risk of sick leave when exposed to lack of adjustment latitude was reported, one cannot assume that the association with sick leave is likely to be similar among non-participants.

The internal non-response varied between the different trigger exposures in the interview. Generally non-response was more common for the trigger exposures where the case period was defined as the first sick-leave day: Non-response was 17-30% for lack of adjustment latitude, 8% for unpleasant work tasks, 23% for a very pressured work situation, and 12-24% for a lower workload than usual. This may imply that the respondents had a hard time estimating exposure on the first sick-leave day, since they were not at work that day. However, the internal non-response also differed depending on the type of control information used, being generally higher when using a weekday-controlled matched pair control period and when using a two-month usual frequency than for other control periods. That missing data is more common in the weekday-controlled analyses are not surprising, since the data was only collected for two weeks prior to sick leave and participants with irregular work schedules may not have worked during a matching weekday during this period. The higher degree of missing data for two-month usual frequency control periods suggest that estimating usual frequency of exposure during such a long period may be difficult for many respondents. The employees who are capable of both estimating the usual frequency over two months and estimating their expected exposure on the first sick-leave day may be a quite selected group for which the general work situation is very similar from day to day. However, the results from analyses using these data are similar to those from alternative analyses, using different control periods.

Selection bias may arise if case selection is related to trigger exposure in the case period. This could be due to non-participation or flaws in the process of sick-leave reporting. Exposure to problems in workplace relationships, a stressful work situation, bullying or harassment may have been a reason for not participating in the study cohort or for declining to be interviewed during a specific sick-leave spell. Sick-leave spells may have been unreported to the project to evade drawing attention to individuals exposed to psychosocial events. Both these situations may imply that exposed cases are missed, leading to underestimated effect estimates.

Within-individual control period selection bias can arise if an individual experiences a steady up-ward (or down-ward) trend in exposure. Under such circumstances the usual frequency of exposure over a longer period does not reflect the probability of exposure at the time of onset, and the effect estimates will be biased towards infinity (or zero if the trend is downward). In study IV, the two-month usual frequency control periods may have been biased if an decreasing trend in the workload existed over the two-month period, however the effect estimates does not differ notably from those resulting from analyses including other types of control information.

7 CONCLUSION

The overall aim of this thesis was to identify and estimate the effect of factors at work which influence ill individuals to take sick leave. The results indicate that problems in the relationships with superiors or colleagues, and experiencing a very stressful work situation or a lower workload than usual may trigger ill individuals to take sick leave. The results concerning the effect of lack of adjustment latitude is more ambiguous, suggesting that the measures of adjustment latitude used could capture more than one latent aspect of the work environment.

The broad message of this thesis is that the sick-leave process is not just a matter of identifying risk factors of illness and reduced health. The decision to take sick leave happens in a multifactorial web of circumstances, where health and illness, and their effect on work ability, are not the only important factors. Although illness can be assumed to be strong trigger of sick leave, something else may be the straw that breaks the camel's back. This thesis sheds some light on what such straws may be.

The results from study II and study IV may imply that sick leave in some instances is used as coping mechanism in very responsible way, that ill individuals tend to plan their sick leave to the days when it does least harm to the organisation. The results also suggest that sick leave may be used by the employer to allow for recuperation when considered possible from a production or organizational point of view, rather than to make efforts to adjust work to be able to make use of employees with temporarily reduced work ability. The overall results suggest that events and situations at work may lower the threshold of work ability reduction, at which an individual feel the need to take sick leave.

Sick leave is not like most health outcomes, where the ultimate goal can be minimizing the outcome incidence. We want to be able to take sick leave, and we want individuals who are too ill to work to report sick. However, interventions to improve workplace relationships and to optimize the workload to the individual employee's capabilities may have both long-term health-improving effects and, as suggested in this thesis, trigger effects on the decision-making situation of the ill employee.

7.1 FUTURE STUDIES

These are, to my knowledge, the first studies trying to identify work-related triggers of sick leave. Future studies of samples which are representative of a larger part of the workforce, with possibilities of studying effect modification by stable factors, and confounding and interaction between different triggers, are needed. The previous studies of work-related factors and sick leave have mainly assumed an overall relatively stable level of exposure, and mostly do not specify whether the effect is assumed to be immediate and transient or long-lasting. Studying the reported trigger exposures in relation to such stable exposures is of importance to better understand the importance of work-related factors in the aetiology of sick leave.

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APPENDIX 1 - ENGLISH TRANSLATION OF QUESTIONS IN THE BASELINE QUESTIONNAIRE WHICH WERE USED IN THE ANALYSES

Self-rated health: What do you consider your general health status as in general?
(answer alternatives: very good, good, fair, poor, very poor)

Longstanding illness: Do you have any longstanding illness, ailment after an accidental event, any handicap or other weakness? (answer alternatives: No, Yes)

Work ability: If we assume that full work ability is equivalent to 10 points, how many points would you give your work ability in general? 0 means that you cannot work at all and 10 that you work ability is at its best. (Answer alternatives 0-10)

Occupation/position (manually coded into SEI and SSYK-codes): What occupation/position do you have? (open answer)

Normal number of workdays: How many days a month do you work? (open answer)

Adjustment latitude, general question: If you are tired, out of sorts, or have a headache, are you able to adjust your work to how you are feeling? (answering alternatives: never, seldom, sometimes, often)

Adjustment latitude, gate question to specific questions: In what way can you adjust your work if you feel out of sorts, have pain, a cold or similar?

Specific questions then following the gate question (all with answer alternatives: no, yes):

- a) Can perform necessary work and postpone the rest
- b) Can decide for myself what to do among my tasks
- c) Can get help from other colleagues
- d) Can work slower than usual
- e) Can take longer breaks
- f) Can shorten the workday
- g) Can go home and finish the work later
- h) Can work without disturbances at my workplace
- i) Can work from home

Attendance requirements: Can staying home for one or two days because of illness, be hard for you because of work? (answer alternatives: always or often, sometimes, seldom or never)

Civil status: Do you live in a partner relationship? (answer alternatives: no, yes)

Children: Do you have children under the age of 7? (multiple simultaneous possible answer alternatives, no, yes _ children live with me full-time, yes _ children live with me part-time, yes _ children which do not live with me)
Do you have children which are between 7 and 18 years old? (multiple simultaneous possible answer alternatives, same as the question above)

Domestic work: How large a share of the total amount of house work do you perform?
(open answer)

Household financial situation: If you would end up in an unforeseen situation where you have to raise 14000 SEK within one week, would you be able to? (answer alternatives: yes always, yes mostly, no mostly no, no never)

APPENDIX 2 – EXAMPLE OF TRIGGER QUESTION SET FROM INTERVIEW AND ALL GATE QUESTIONS IN ENGLISH

EXAMPLE OF TRIGGER QUESTION SET

Have you, during the last year, experienced situations where you have felt disregarded or “brushed aside” by your superior?

For instance, maybe he/she has made a decision which concerns you without you getting a chance to have a say about it, or that your area of responsibility has been restricted giving you different work tasks or decreased decision authority, in a way that you have not wanted.

☐ No

☐ Cannot answer

➔ I would still like to ask you to think extra hard about how it has been during the last two weeks, have you experienced anything like what I described during that period?

☐ No (Move on to next gate question)

☐ Yes ➔ the matrix + usual frequency

☐ Yes

When was the last time you experienced this? Days/weeks/months ago

If > 2 months ago ➔ I would still like to ask you to think extra hard about how it has been during the last two weeks, have you experienced anything like what I described during that period?

☐ No (Move on to next gate question)

☐ Yes ➔ Matrix + usual frequency

If > 2 weeks but < 2 months ago ➔ ➔ I would still like to ask you to think extra hard about how it has been during the last two weeks, have you experienced anything like what I described during that period?

☐ No (Move on to next gate question)

☐ Yes ➔ Matrix + usual frequency

If <= 2 weeks ago ➔ the matrix + usual frequency

The matrix:

Weekday	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun

Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun

Mark first sick-leave day
and sick-leave report day.

Usual frequency:

How many workdays during the past two months have this happened?

☐ Every day About days the past two months

Uncertainty in estimation:

☐ week 1

☐ week 2

☐ usual frequency

Comment: _____

GATE QUESTIONS OF TRIGGER EXPOSURES USED IN ANALYSES

General adjustment latitude:

Have you, during the last year, had the possibility to change your work tasks or your workday in any of the following ways if you would have needed to for some reason?

- Do necessary work and postpone the rest
- Temporarily change to less demanding tasks
- Work slower than usual
- Take longer breaks
- Shorten the workday
- Work from home

Health-problem conditional adjustment latitude:

Is there any day during the last year when you could have changed your work tasks or your workday to such an extent that you could have worked despite having _____ [the stated health problem at time of sick leave]?

Lower workload than usual:

Have you, during the last year, experienced a low workload at work?

Maybe you have had a hard time filling your work hours with work tasks because of a lower inflow of orders, being in a period between two projects, more available staff, fewer patients/clients, or having a smaller area of responsibility than usual

Problems in the relationship with a superior:

Have you, during the last year, experienced situations where you have not received sufficient appreciation from your superior?

Have you, during the last year, been involved in a quarrel or conflict with your superior?

Have you, during the last year, experienced situations where you have felt disregarded or “brushed aside” by your superior?

For instance, maybe he/she has made a decision which concerns you without you getting a chance to have a say about it, or that your area of responsibility has been restricted giving you different work tasks or decreased decision authority, in a way that you have not wanted.

Has it happened, during the last year, that you have been criticized by your superior?

For instance for doing a poor job, arriving late or something similar?

Problems in the relationship with colleagues:

Have you, during the last year, experienced situations where you have not received sufficient appreciation from your colleagues?

Have you, during the last year, been involved in a quarrel or conflict with you colleagues?

Bullied, discriminated, sexually harassed or harassed in other way:

Have you, during the last year, felt discriminated against, bullied, sexually harassed or harassed in any other way at work?

Unpleasant work tasks:

Have your, during the last year, had a work task which you felt was unpleasant, which you were afraid you would not be able to perform well enough or which you for other reasons wished you would get out of performing?

Very stressful work situation:

Has it happened, during the last year, that your work situation has been very pressured?

For instance, that some days, you have had unusually much to do, you have had a pressing deadline, that you have gotten more work tasks or larger field of responsibility than usual.